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ABSTRACT

The basic resource materials in this document represent the cooperative efforts of graduate students enrolled in a 2-week field learning class at the State University of New York, Plattsburgh. These reports are an initial attempt to acquaint teachers with the many activities available to enrich the curriculum through the Outdoor Education Methods. Report titles are: Art in Nature; Health Education Through the Out of Doors; Language Arts in the Out Doors; Mathematics in the Out of Doors; Music in the Out of Doors; Outdoor Education for the Middle School Years; Physical Education in the Out of Doors; Sensory Awareness Through Outdoor Education; Learning Science in the Out of Doors, K-4; High School Science in the Out of Doors; School Site Utilization; Social Studies in the Out of Doors; and Water and Its Importance in the Ecological Systems of the World. (KM)

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Outdoor Education Activities For The School Curriculum

1972

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Graduate Student Reports
from "Outdoor Education
Program Planning for the
Classroom Teacher"

Education 515
State University of New York
College of Arts and Science
Plattsburgh, New York

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RC007543

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The following basic resource materials represent the cooperative efforts of graduate students enrolled in a two-week field learning class. These reports are an initial attempt to prepare materials to acquaint teachers in the many, many activities available to enrich the curriculum through the Outdoor Education Method. The thrust of these reports is to provide a starting point which will encourage a teacher to investigate further through the related literature the specifics of how to conduct outdoor education activities using on-site and nearby environments.

It is the hope of this class that the reader will go out doors with her class and experience the joy of discovery which provides excitement, reference, and more meaningful learning for all.

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ART IN NATURE

BY:

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August, 1972

Course

Ed. 515 Outdoor Education
Program Planning for the Classroom
Teacher

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Art is nature. Nature is art. The role of the teacher is to make the child totally aware of his world. Art experiences can easily be coordinated with the outdoors, and these experiences will be of a depth far beyond the simple elusions. Creativity is the feeling and the excitement, which comes from total awareness. Inspiration comes from everything, whether it be a rock, tree, flower, or even a brick building, or a neatly laid out city square.

The child is a wonderful resource of creative energy and we must help that child to come to use his potential to its fullest degree through the provision of opportunity, materials and equipment which in turn bring about circumstances and ideas. The end product is not of great importance, its the experience and satisfaction gained from the experience which yields a happier more thoughtful child.

Activities should be centered around varied probable settings, their goal to help the child sense, wonder, understand, and desire to sense some type of beauty using nature as inspiration. Our opportunities should be concerned with encouragement, awareness, challenge, stimulation, individual expression, enjoyment and appreciation.

The limitations for art in nature would include the age of the child, his maturity, his motor control, and his environmental experiences. Various projects can be used to meet the needs of children and their varied abilities. If the teacher displays an enthusiastic attitude the children will make great efforts to do the best they can.

Art in nature could be just picking up a small piece of wood, feeling it, looking at it closely, and imaging about the different forms it has, or lines it could have, or even shapes within it. A child's curiosity and esthetic feelings need to be kindled, and brought into a burning blaze, so mankind will not become Charlie Chaplin wind-up men. Thus pigeon-holed bored adults will be somewhat fewer through creative art and caring.

The establishment of a curriculum in art includes a flexible program which can be used by all grade levels, K-12. The basic elements of art are major to all types of projects. These elements are building blocks or a vehicle to an experience.

The following curriculum includes the elements of art stated as objectives.

1. In nature the child can see all the values, intensity, and compliments of <u>colors</u>. (The harmony of life.)

2. Two dimensional surfaces in the world will be used to stimulate the child's imagination.

3. Through nature the child can see distance and realize that it is only an illusion on his paper.

4. Line can express all the sensitivity and capabilities of the child. A line can take many forms, either two dimensional or three.

5. The children will use three dimensional uses or objects in nature as a sculptural medium. The child will sense volume.

6. Through observation the child can become aware of the lightness and darkness of objects. The variety of the simgular will be noted.

7. The student will become aware of the texture and images within objects.

The following list of creative art activities through the out of doors can be made more difficult or more simplified according to the needs of the children and the teacher. Suggestions for gluing, including Elmers, rubber cement, and epoxy.

ACTIVITIES

Yarn stringing in nature (shapes and patterns)

Taking a small picture and building with things gathered from the out doors

Use of foil to rub and feel textures and patterns.

Listening to the wind rustle through the trees and painting the feeling you have.

Painting feelings when sitting by some type of water.

Decoupage of wood and bark

Spotting shapes in building stones

Building fine stick towers and houses

Use of fallen birch bark for paper.

Use of driftwood for decorating.

Observation of leaf prints on the sidewalk.

Shapes in bridges.

Rebuilding old fallen down buildings through imagination.

Things which come from nature - drawing what you imagine it to look like.

Textural rubbings of fire escapes, old buildings, and others.

Collecting things from an environment and arranging it between clear plastic contact paper.

Take a walk and feel textures and listen to sounds. Come back and illustrate feelings and thoughts.

Collect sand, dirt and mud. Use the mud to paint with. Draw pictures in the sand and dirt.

Find all the shades of colors in the buildings and houses.

Notice silhouettes of clouds and tall buildings.

Design reflections of the sun from windows.

Examine shapes and textures in roads and other things built by man.

Examine tree textures and patterns and use for design illustrations.

Stiching patterns can be borrowed from buildings and natures' wonders

Nature boxes from some basic box and decorated would be good gifts.

-pine cones - puppets, owls (owl heads cut from small piece of birch bark and glued to cone) turkeys (heads and necks carved from small twigs)

-pressed flora - collect and press plant stems, leaves and flowers until dry. Glue on white paper.

-sand art - soak in vegetable dye of desired color. Remove sand from solution and dry before using. Draw desired design on wood or heavy cardboard. Saturate string with glue. Place on drawn lines and press firmly. Let dry. Use small brush to spread glue freely. Pour colored sand into stringed areas. Press sand into glue and let dry.

-leaf scapes - use many different leaves. Press until dry. Place on sheet of construction paper for design. Hold leaves in place with pins. Lightly spray with various colors.

-paint pictures with clay -

-colors - Fall of the year, sponge painting. Discovering different colors on the same tree. Painting outside. How many different shades of green can one find outside?

-discover colors in clay

-mud painting on rocks

-making ripples in stream with hand or foot

-imagining things in the shapes of clouds

-crayon rubbings of leaves

-gravestone rubbings

-collages - leaves, pebbles, seeds. Burlap provides a good background for some.

-closing eyes and touching stones, bark, etc. to be more aware of texture.

-terrariums

-barnside painting

-use of lumberyard materials

-sunlight - how does it make you feel?

-weaving with reeds, cattails

-make animals out of stones

-pull apart pine cones to fill in designs drawn on paper.

Take the children into a field and have them take their shoes off. Can you see the world through your feet?

What is night? Feel the trees touching the sky? Look for the night dragon creeping across the sky.

Are you aware of the many varied songs in a stream? What moods do you get from the different tones?

Have students draw objects from nature; toad stools, branches, pine cones, etc. illuminated by candle light.

Have the children draw sea shells as they are. Then turn them into creatures and place them into an environment.

What would the world look like if you were a tree, a rock, a babbling brook, a hawk or even a tiny ant?

Take a moss covered piece of bark and place it under a dissecting scope. What kind of life can you imagine? Can you see elves and fairies looking at you? What do you see?

In a wooded area is the possibility of a D line design.

Have you ever thought of the shape of a leafy branch being made by the sky.

Have the students write poetry from observations made in nature. Illustrate them and make a class book for the library.

What's a cloud? Is it just moisture all lumped together or is it magically changing forms and shapes.

Observe the shapes fallen leaves make on the sidewalk.

Study knot holes in a piece of wood or lines on a sidewalk. From these, abstract designs can be found or imaginary creatures.

Rubbings: of bricks, tree trunks, leaves, gravestones, rocks.

Printing using: leaves, potato, Jack in the Pulpit Root, pine cones.

Do an ink sketch using a branch or feather.

Banner using birch bark and yarn

Use a branch as a weaving loom.

Make a collage from things collected from nature.

Make creatures out of stones, twigs, nuts, and pine cones.

What mood would you get if you used a branch, a flower, or a feather for a brush?

Gather owl pellets, disect them, and have the children discuss what type of animal it was. Then draw the skulls and fragments found. They could also sketch what the original animal looked like.

Sand casting: add to your design with small stones and sticks.

Sketch 10 different types of trees. Note the different structure in each.

What shapes do dead trees have? Are they stronger or weaker than live tree shapes? What parts are missing? What are left?

How many shades of green are in one square foot of foliage? Reproduce them in a monochromatic picture.

Using staghorn sumac, make napkin rings and darning eggs.

Have you ever seen colors clashin a natural setting?

Stones can be an imagination stretcher and also a marvelous painting surface.

Use natural dyes as paint pigments. These could also be used to dye cloth or yarn. Examples: Tan - coffee; Purple - milk weed flower; Gold - onion; brown - butternut; dark brown - black walnut; purple - red cabbage; yellow brown - tea.

Magic pictures using sour milk, lemon juice, vinegar. Draw the picture than go over it with a warm iron. Clorox on colored paper is an interesting media.

Melt wax. Drop a spoon full in cold water and describe the shape. Bayberry wax and beeswax can be used.

Collect soft stones and mix with oil. Produce type of ink.

Cattail torches, a piece of glass, paper and grease makes an unusual media for printing.

Check a muddy bank for animal tracks. Have the kids write a story or draw a picture about what happened at this spot.

Using only things in nature have the children describe the colors.

Make bark, seed, pine cones, cracked dyed egg shell mosaics.

Spray a spider's web with white paint; then press it between two sheets of black paper.

Study life for beauty, movement, anger, simplicity, and all aspects of human emotion.

Tree weaving - using flexible branches, string and various long grasses (cattails) for the weaving.

Terrariums - use different colored mushrooms, lichens, and mosses, Partridge berries and small ferns.

Drift wood designs - drift wood comes in many sizes, shapes and textures which can be collected for use as models for designs, wall hangings or pleasing decorations out of doors.

Clay pots - many areas in the north country have clay deposits which yield clay clean enough to be used in its natural state, without washing. Make the pot, which the children might decorate by pressing hemlock branches into the partially dry pot or incising the pot with a sharp stick to form a design. The pot might be used as a bird feeder or planter and can be hung from the tree by a macramed basket holder.

Woodland and field plaques - Materials may be found at the site of old saw mills.

1. Find old board- watching for shape,texture (rough or weathered smooth), color.

2. Dried Queen Anne's lace - milkweed pods on stick-tezel-bittersweet pinecones and any other dried seeds or flowers that might be available.

3. Make arrangement on wood and fasten with epoxy, elmers or Hyplar.

Paper weights - use small mustard or babyfood jars. Find colorful flowers in the area...liquid plastic or clear glue.

Milk weed pod ornaments for Christmas trees.

Pinecone animals or creatures.

Printing with sticks, pine cones, flowers, feathers

Nut jewelry

Dyes - made from bark, nuts and flower blossoms

Painting - use juices from berries;birch bark might be uses as the painting surface.

Basketry and weaving - use firm materials as the warp and flexible materials (cattails, wild grapevines) and the roof.

Rock creatures or paper weights

Pine cone wreaths and center pieces

Pine cone designs - separate pine cone seed covers. Draw design glue different size cone covers to design. Design could be realistic or abstract.

HEALTH EDUCATION THROUGH THE OUT OF DOORS

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August, 1972

Course

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Health Education through the Outdoors

I. Definitions

A. Health Education: The understanding of physical and mental well being and how it can be fostered and maintained.

B. Why The Out of Doors?

1. Man's physical and mental well being is directly dependent upon his total environment.

2. Obviously to do what one cannot do inside.

3. To reinforce previous skills taught within the classroom.

4. To learn from first hand experiences.

5. To offer a new learning situation.

6. To teach new skills and problem solving experiences.

C. Limitations

1. Outdoor activities should be relevant to previously discussed material.

2. Activities should not be so abstract as to hinder understanding.

II. Curriculum Areas

A. Pollution:

1. The silting of streams and reservoirs as a threat to water supplies.

2. Safe sewage disposal by towns and homes.

3. The adverse effect on the life cycle.

B. Physical Fitness:

1. Maintaining a proper level of activity.

2. Developing proper attitudes towards physical well being.

C. Sex Education:

1. Understanding the process of reproduction.

2. Relating this process of nature to man.

3. Developing healthy attitudes towards sex education.

D. Conservation:

1. Some health hazards can result from exploitation of resources, ie. block cutting, swamp formation.

2. The destruction of beneficial species of wildlife.

E. Hygiene:

1. Maintaining proper bodily cleanliness.

2. Discussing the idea that different activities require suitable apparel.

F. Nutrition:

1. Preparing a healthy menu while camping or working in the out of doors.

2. Proper preparation of fun and games.

3. Selection of edible foods.

G. Safety Education:

1. Safety in recreation.

2. Safety in work experience.

3. Developing proper attitudes toward safety.

H. Drugs:

1. Relating mis-use of drugs to mis-use of chemicals in nature.

I. Communicable Diseases:

1. Controling of disease related pests in our environment.

2. Inter-relationships concerning the spread of disease.

J. Mental Health:

1. The development of self-awareness and an awareness of others.

2. The developing of confidence within a varying environment.

K. Over Population:

1. Studying of population, relationships within a biome.

2. Relating nature's problems to the mankind.

III. Suggested Activities

A. Pollution:

1. Visit Sanitary Landfill - Evaluate.
2. Visit Water Purification Plant.
3. Visit Sewage Treatment Plant.
4. Visit Sludge Bed at Paper Mill.
5. Visit River Mouth to view erosion and life.
6. Conduct a re-cycling project.
7. Check own school for types and uses of fuel. Are they pollutants? Are there substitutes?
8. Trip to identify major sources of area pollution.
9. Clean-Up day.
10. Check own home for sources of pollution.
11. Visit a farm to check disposal of animal and human waste.

B. Physical Education:

1. Have students plan, organize and conduct an outdoor field day.
2. Take a mountain climbing trip.
   a) Study comparative pulse rates.
   b) Discuss physical signs of fatigue and exhaustion.
   c) Why are some students less effected by physical exertion?
3. Observe the activity of a young child. Try to copy the activities of a young child for five minutes.
4. Why do athletic teams encourage training rules.
   a) Visit a high school athletic practice.

C. Sex Education:

1. Field trip to observe various fertilization mechanisms and processes, ie. pine cone, cattail, etc.
2. Visit a farm to observe natural birth.
3. Visit fish hatchery.

4. Check insects for various stages of life.

5. Hatch chicks in your own room.

D. Conservation:

1. Visit local game warden and forest ranger.

2. Visit Miner Institute.

3. Use Biltmore stick to measure diameter of tree and determine number of board feet.

4. Study mosquito breeding areas and discuss means of control.

5. Observe various degrees of land cover and make demonstration boxes for each.

6. Conduct erosion abatement project in a nearby area.

7. Discuss farm conservation techniques during a farm visit.

E. Hygiene:

1. Visit local health clinics.

2. Take a field trip during two seasons and compare various wearing apparel.

3. Take a winter field trip to observe the animals preparing for winter.

4. Take a camping trip to practice proper techniques of cleanliness and campsite sanitation.

F. Nutrition:

1. Check height and weight of class during course of year.

2. Take a field trip to identify edible wild plants.

3. Prepare balanced diet and take cookout trip.

4. Plan a school's menu and observe a daily preparation.

5. Disect an animal's stomach and observe what it feeds on.

6. Visit local markets and grocery stores and study storage facilities.

7. Study food spoilage under microscope.

8. Try preserving meat through smoking, salting or drying.

G. Safety Education:

1. Visit construction site and observe safety measures.
2. Examine value of present school safety rules.
3. Visit fire tower and discuss safe fire building techniques.
4. Identify poisonous plants and insects of the area during a field excursion.
5. Take a bicycle trip and discuss

LANGUAGE ARTS IN THE OUT DOORS

by

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August, 1972

Course

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The use of the art of language is to hear and understand talk and be understood, in other words, the art of communication. We need not be very skillful to hear, slightly more to talk, but comprehension and organization of one's thoughts for speaking are skills which may be learned, as are reading, writing, spelling, phonics and all other aspects of learning. Language Arts is the media of such learning. Many of our activities over lap because the area knows no limitations.

The natural child is most comfortable out of doors, unconstrained by four walls. Perhaps the discipline of learning can best begin here and be taken inside to pursue and develop. As sounds from the out of doors were heard, loved, and developed by copied musicians, so other disciplines can find their source in nature and be nurtured in the school room. Each of the following attributes or concepts may be enriched by language arts outdoors.

a. New stimuli for learning. For example, the desire to read for information.

b. Increased awareness of natural phenomena.

c. Improvement of self image by built-in success possible in outdoor programs.

d. Organization and categorization of ideas and materials.

e. Developing new methods for giving directions and skill in following directions.

f. To increase and vary verbalization.

g. Development of values -- help kids to think out different alternatives and consequences involved in decision making.

h. Creating a climate for recall.

i. Sensitizing for improved listening

j. Development of investigative techniques for research.

k. Thoughtful reading attitude for whatever purpose; information or pleasure.

We will remember that direct experiences, rather than vicarious, satisfy curiosity and lead to meaningful learning. The following are specific activities designed for enriching four areas of Language Arts: reading, listening, spelling and expression (oral and written).

a. Reading

1. Keep a log of the walk or trip.

2. Follow a nature trail, reading the signs. Then make a class trail, doing our own signs.

3. Have an outdoor poetry reading session.

4. Reading maps and making maps.

5. Visit an old cemetery. Read the epitaph, names and dates.

6. Read "How to Do It" manuals and give the class and and outdoor demonstration.

7. Make class charts of walks and trips.

8. Read about explorers and naturalists.

9. Have a treasure hunt. Give each group of three or four children printed directions from the school to their "treasure." Each group will take crayons, pencil, paper. Go out the cafeteria exit. Walk down the path to the little playground. Turn right and walk along the edge by the trees. Stop at the tallest tree. Look all around the bottom. What do you find that doesn't belong there? The treasure will be something not indigenous to the area, like a shell, a piece of driftwood, a starfish, etc. One of the group will draw it, one will label, one will write and one will tell about their trip to the class.

10. Make up crossword puzzles from vocabulary learned out of doors.

b. Listening, observing, perceiving

1. Where to go? Giving and following directions.

2. Stop and listen. Close your eyes, ball your fist, and count the different sounds you hear by extending a finger for each.

3. Be a player and a leader of outdocr games.

4. During a class walk ask children to "take a picture." Have them make a box with their fingers, look through and find the scene they like best for their picture. Let them study this small area to remember its arrangement. Then either sit down and sketch it or take their picture back in the classroom and draw it from memory.

5. Lie back in a comfortable spot, feel the earth under you and see the sky above. Watch the clouds, their movement and shape.

6. Take a tape recorder along on a trip to the woods. Sit very quietly for two minutes, then turn it on. You may record the wind, bird songs, etc.

7. Players sit in a circle. The one starting the game says, "From where I am I can see a gray birch." The next one says, "From where I stand I can see a gray birch and a black cherry." The next player repeats all the previous players have said, in exactly the same order, and adds another tree or bird. If anyone doubts the statement, he may challenge the speaker. Anyone caught unable to defend his statement drops out of the game.

C. Spelling, phonics, vocabulary enrichment

1. The root of the word ecology -- from two Greek words meaning "study of the home" opens up an infinitely greater wealth of consideration. All of the words necessary to use and understand in the out of doors give a richer vocabulary. Examples: trail, swamp, ledge, geology, shelter, fossils, poison ivy, counselor, fern, moss, glaciers -- the list is endless.

2. Proof read your own written work. If you are not sure of the spelling, ask.

3. Look around you for all the things you can find beginning with "B" (or any other consonant). Make a chart for your room.

4. What sounds do you hear? Try to put letters together for the sound of a stream, or a particular bird.

5. Riddles -- "I am thinking of a tree that begins with 'M', etc."

6. Spelling Bee -- Divide players into groups. Play the game with fall flowers, insects or trees. Hold up a flower. The first in line must name it and give an interesting fact about it. If he fails, he must drop out of line. The side having the greatest number remaining wins. It is better to commence with the most common and well known plants.

7. Nature Alphabet -- This is played with "sides." The leader names a letter of the alphabet. Each player on each side in order names a bird, flower, or tree (decided upon before starting) which begins with that letter. Anyone who cannot do so in less than five seconds is out. No one is to name an object which has already been named. The team having the greatest number of players left at the end of a certain time is the winner, or the last group to name an object commencing with that letter wins one point for his team.

8. Sound Locator -- A good woodsman can locate a sound quickly both as to direction and distance. As a preliminary training, have "it" stand with back to ten or twelve people. No person to be nearer another than ten feet. A leader points to someone who whistles. "It" turns around quickly and names the one who whistled. If correct, the whistler takes his place, or it may be scored by using the best average for ten trials. Outdoors, this may be tried by rustling autumn leaves on the ground, by wading in water, by jumping in the sand, by dropping a stone a few feet away and having the person identify the stone, by snapping a twig, by taking three steps, and so on.

D. Written and oral expression

1. Collect interesting objects for a science table. Each child will tell about what he found and why he likes it. Research the object for identifying purposes.

2. A walk to a quiet spot, a few minutes contemplation, can provide the inspiration for creative writing. The Haiku, a three line, unrhymed composition of 5-7-5 syllables, is an excellent medium for spontaneous expression. Others could be the Cinquain and Diamete.

3. Experience in nature provide the basis for written and oral expression. Walking to a stream, wading it, watching a chipmunk or the flight of a swallow, all must be experienced and observed to become a part of a person. All outdoor happenings become the basis for written and oral expressions.

4. Postcards or letters asking permission or thanking for help.

5. Labeling and identifying.

6. Preparation and participation in original out of door drama.

7. Discussions of observations.

8. Poems and stories

9. Class newspaper write-ups of outdoor experiences.

10. Interviews of conservationists.

11. Tapes describing the science table or nature walks.

12. Look for animal footprints. Make deductions and draw conclusions as to which animal made them.

13. Make foods for outdoor consumpition by following simple recipes.

14. Make simple weather charts.

15. Pretend you are a Martian landing on our planet and use different vocabulary to describe what you see. (You can't use the objects name.)

John Dewey has said that we cannot substitute a book for civilization. Alfred Whitehead warns of divorcing education from life. Outdoor education attempts to deal with realities, rather than second hand information. Language is a major tool of education; as the child progresses in language skill, he also develops in intellectual, social, and emotional capacities. He can develop well in all these areas in a rich and varied program of outdoor activities.

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MATHEMATICS IN THE OUT DOORS

by

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August, 1972

Course

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Program Planning for the Classroom
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I. A. Definition:

We are developing mathematical concepts through the outdoors in the areas of measurements, time, estimation, geometry, counting and fractions showing the practical application of math using "mother nature".

B. Reasons:

1. complaints of teachers on all levels
2. lecture and demonstration approach indoors unsuccessful
3. rote learning- boring, impractical, irrelevant
4. topics often avoided be cause of negativeness of both students and teachers- past experiences very unstimulating

C. General Objectives:

1. Make mathematical concepts relevant to student's needs and desires through use of out of doors
2. Stimulate learning so stuents will explore and experiment on own
3. Provide opportunity to make mathematical instruments
4. Applying their ability to use instruments properly and to advantage
5. Develop concept of estimations through varied concepts

II. A. Measurements

1. Demonstrate abstract concepts of measurement
   a. acre
   b. cord
   c. boardfeet
   d. heights of trees- Biltmore stick
   e. associative, communative and distributive principles

2. Reinforce common concepts of measurement
   a. Units of measure (feet, yards, miles, etc.)
   b. Use measurement to find distances and other measures of volume, weight, etc.
   c. direction

3. Illustrate measurement by use of games and exercises
   a. refer to activities

B. Time

1. Demonstrate abstract concepts of time
   a. seasonal
   b. daily (morning, noon, night)

2. Reinforce common concepts of time
   a. units of time (seconds, minutes, hours etc.)
   b. plant growth within specified length of time
   c. animal growth within certain time
      e.g. tadpoles to frogs, eggs to chickens

3. Illustrate time using games and exercises
   a. refer to activities

C. Estimation

1. Demonstrating abstract concepts of estimation
   a. sizes
   b. distances
   c. numbers (sets)
   d. time
   e. speed

2. Reinforce common concepts of estimation
   a. estimating totalness of specific values
      1. sums
      2. products
      3. differences
      4. quotients

D. Geometry

1. Demonstrate abstract concepts of geometry
   a. various shapes
   b. angles (triangulation, direction)

2. Reinforce common concepts of geometry
   a. types of polygons
   b. relative sizes of shapes (nature objects)

3. Illustrate geometry through games and exercises
   a. refer to activities

E. Counting

1. Demonstrate abstract concepts of counting
   a. sets (union and intersections)
   b. time and distance

2. Reinforce common concepts of counting
   a. basic numerals
   b. number counting (sticks, pebbles)

3. Illustrate counting through games and exercises
   a. refer to activities

F. Fractions

1. Demonstrating abstract concepts of fractions
   a. arithmetic series
   b. comparisons of fractions (grater or lesser)

2. Reinforce common concepts of fractions
   a. operations of fractions (div., mult., add, subtract and reducing)

3. Illustrate fractions through games and exercises
   a. refer to activities

III. Activities:

The following activities may be applied to more that one area depending on the student, teacher and the situation.

A. Measuring

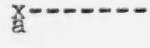
1. measuring acreage using string, pacing, students' bodies tapes
   a. rural areas-woods, fields, playgrounds
   b. urban areas-parks, playgrounds, shopping center parking lots

2. measuring a cord
   a. rural- cutting logs, limbs (available wood) stack into a cord (4' by 8')
   b. urban- rolling newspaper and using cardboard tubes to stack into cords

3. measuring boardfeet
   a. rural - using biltmore sticks, tape measure to measure trees
   b. urban- same equipment to measure trees in park, wooden telephone poles, building columns

4. measuring the height of objects
   a. rural- using biltmore sticks, triangulation on trees, schools, flag and telephone poles
   b. urban- same as above

5. measuring by use of the associative, communative, and distributive principles
   a. rural- pacing off in one direction will equal the distance of return in the opposite direction- communative

      associative:  distance from A to B plus distance from B to C equals distance from C to B plus distance from A to B.

      distributive:
      tax on a tent plus tax on an ax equals tax on the sum of the tent and ax.
      also measuring through planning a camping trip- using principles on costs of outdoor equipment

   b. urban- instead of camping trip, go to a supermarket or dept. store- refer to above

6. using units of measure
   a. rural- measuring school building, grass area by feet and change into yards (how many lengths of schools will make a mile?)
   b. urban- measure sidewalks, parking lots, schools and do the same as above

7. measuring by distance, volume and weights
   a. rural- using various liquid and dry measures to show relationship between units

example measure quarts and gallons of pond water, pints of wild berries and/or fruits make make up recipe using natural foods

b. urban- using same application as above measuring water in park fountain, sand piles

8. measuring directions
   a. rural- wind or stream velocity- making hand made anemometer and gadget for flow of water
   b. urban- same as above except for stream use fountain or possibility of hydrant

B: Time

1. Seasonal
   a. changes in plants and animals from fall to spring to fall again
   b. changes in clothing of students from one time of the year to another, along with changes in temperature

2. Daily
   a. observe animals or plants at various times of the day to see changes
   b. visit parks or school area to observe changes in plants and animals from morning til night

a=rural
b=urban

3. Units
   a. set up an agenda for a field trip or excursion- working with time units
   b. plan or draw up the daily routine

4. Plant and Animal growth
   a. plant seeds to observe growth over a period of time
   b. observe young animals growth to maturity

C: Estimation

1. Sizes
   a. estimate sizes of trees in a plot
   b. estimate the size of a lamp post

2. Distances
   a. estimate distance between two points and check the measurement
   b. estimate length of blocks, halls

3. Number sets
   a. estimate the number of trees in an area
   b. estimate the number of people in a crowd

4. Time
   a. estimate a time to run in a set distance

5. Speed
   a. estimate speed of a car or bike over a set distance

6. Operations (sums, differences, products, etc.)
   a. estimating amount of bread for sandwiches and total cost of a field trip to be taken by students

B. Geometry

1. Shapes
   a. study geometric patterns in animal markings and patterns used in nature (honeycombs)
   b. shapes of buildings, sidewalks, windows, lamposts.

2. Angles
   a. use protractors to find angles of inclination of trees, buildings.
   b. same as above

E. Counting

1. sets
   a. finding the number of types of plants found in a small area by throwing a hoop and observing the inside area.
   b. use lawn, driveway with the above.

2. time
   a. set off a rocket and let some students time the launch.
   b. same as the above, but doing this in a large area.

3. basic numerals
   a. make numerals from objects they find outside.
   b. look at house numbers, street signs etc.

4. number counting
   a. use sticks, pebbles, trees in a certain area
   b. use sidewalks, stones to count

F. Fractions

1. arithematic series
   a. observe leaves on certain plants and retate to fibonnacci sequence
   b. same as the above.

2. comparing fractions
   a. show that some fractions are greater or less than others by using leaf veins.
   b. split up apples, candy bars, etc.

3. operations
   a. what fractional part of the group have blond, black, or brown hair.
   b. same as the above.

MUSIC IN THE OUT OF DOORS

BY:

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August, 1972

Course

Ed 515 Outdoor Education
Program Planning for the Classroom
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The purpose of this unit is to give teachers a guide to music in the out of doors. Through simple activities and observations, the student can learn that both the sound and interpretive structure of all types of music can find roots already existing in the world around them. It is the incorporation of sense utilization to man's environment for the specific purpose of creativity.

Objectives

At whatever educational grade level, the student will be able to:

1. State the origin of music
2. State the origin of musical instruments
3. Redefine the significance of music to one's self
4. State the purpose of music to his peers
5. State the purpose of music to society as a whole
6. Identify variety, abstractions, sophistications, and complications in the evolution of music.
7. Appreciate the creative expression of man and nature
8. State the many facets of music
9. Participate in music appreciation activities
10. Recreate musical instruments from natural materials found in the out of doors
11. Compare sounds in nature with sounds composed by man
12. State the simple truths of the world which really form the heart of music

General Activities

1. Rural-Field trips to a farm or setting where students can listen to a variety of sounds, such as:
   a. Animals
   b. Birds
   c. Insects
   d. Water (brooks, lakes, waterfalls)
   e. Trees and bushes (movement of)
   f. Voices

2. Urban-Field trips to a city park where the student might have such sounds as:
   a. Traffic
   b. Sirens and horns
   c. Birds
   d. Trees and bushes
   e. Voices

Specific Activities

1. Singing and Dancing
   a. Singing campfire songs
   b. Composing songs about nature and the out of doors
   c. Imitation of bird calls
   d. Playing singing games
   e. Action singing using motions to describe words being sung, i.e., "Six Little Ducks"

f. Making drums, rattles, tom-toms and head dresses for an Indian ceremonial
g. Marching, dancing, skipping, clapping and leaping to music recordings, drum beating and songs
h. Using the natural sounds of nature, i.e., waterfalls, wind in the trees, etc., to perform various dance movements
i. Listening to the sounds that trees make and then perhaps conducting music in the trees (pretend that one is a conductor of a symphony orchestra and the other trees are his musicians)
j. Listening for the sounds that such things as water or a cricket make and then delving into how the sound is produced and then perhaps growing some of the various types for further study.
k. Jump rope in a rhythm
l. Attend a parade and observe the bands marching to their music

2. Making music from Natural Instruments (not altered), such as:
   a. Acorn cap - whistle
   b. Pebbles in a small hollow log or gourd as a rattle or moracca
   c. Hollow reeds - whistles and horns
   d. Branches waved in the air or struck on the ground
   e. Tree stumps - drums
   f. Rub pieces of bark together
   g. Strike rocks together
   h. Find a tree with many branches in reach of students, tap around the tree and branches noting the different pitches from different volumes and lengths
   i. Make up a "nature band" from collectable items.

3. Making musical instruments from Nature, such as:
   a. Stick xylophone - hickory sticks
   b. Turtle Shell Rattle - take shell with a bottom, put in seeds and secure top and bottom and close up head and tail area
   c. Seed Pod Rattle - using Black Locust
   d. Rock xylophone
   e. Birch Bark Banjo -put rubber bands across stable bark
   f. Put a stick in the ground and rub another stick on top
   g. Make a flute from striped maple

4. Other items found in the out of doors that produce musical sounds:
   a. Flute - Tap a long pipe at one end with a hard stick. Then continue tapping while students clutch pipe at various lengths
   b. Wire Fence Guitar - Pluck different wires for different pitches.
   c. Tap the supports of a bridge for different pitches

5. Other Activities
   a. Make up a choir of insects by collecting various types
   b. Have students listen to specific instruments and compare to the sounds they have heard out of doors
   c. Take slides of nature and put them to music

. Relate previously composed music to natural sounds
   a. Listen to a record and write down sounds heard and relate to those sounds found in the out of doors
   b. Listen to such recordings as, Victory at Sea, Grand Canyon Suite, and William Tell Overture, and describe various passages that imitate natural sounds found in nature
   c. Listen to sounds in nature and then compare them to recordings of the same

OUTDOOR EDUCATION FOR THE MIDDLE SCHOOL YEARS

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August, 1972

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OBJECTIVES

Learning can and should be fun

The educator is a leader and guide, not a teller

Outdoor education is as important as indoor education. It should extend, enhance and stimulate classroom work. Indoor and outdoor education are complimentary parts of a whole.

Group dynamics are vastly different in outdoor situations. Students and educators can assume different roles so that all my be involved. Outdoor education should present the child with the opportunity to know himself and his environment and to learn and practice new skills.

The school grounds and surrounding communities are a free and/or inexpensive resource readily available to all in both rural and urban settings.

Outdoor education helps the student to learn to appreciate and respect the world of out of doors and his role in it.

Education for use of leisure time is as important as education for a profession. Camping can supply leisure time education.

MAJOR CONCEPTS

Living things are the product of heredity and environment.

The behavior of an individual stems from an interaction of heredity and physical, social and cultural environments.

Government is an interaction of custom, rule, and law.

The economy of a region depends upon the resources, its use of those resources, and technology.

The culture of a group develops out of the interaction of regional, behavioral, and ethnic factors.

The history of a people evolves through an interaction of individuals, groups,cultures, and events.

The universe is in constant change.

Living things are in constant change.

The environment is is constant change

Living things depend upon the flow of energy and materials from the environment for survival.

Living things exchange matter and energy with the environment

Energy may be transformed;but neither created or destroyed. The total amount of energy remains the same.

Living things

What is alive?

What is the role of death in the life cycle?

What is a weed?

Land is the foundation of the community

The environment determines the community (biome)

Communities change (succession) because environments change

Living things compete with many forces for survival

Group living requires cooperation within and between groups in order to maintain an optimum environment

Food chains, webs, and pyramids are determined by groups within the community

Changes in the environment bring about adaptation, species variation, and extinctions

Cells are the basic building blocks of life; the basic unit of structure and function

Certain structural patterns fit certain environments

Reproduction is an integral part of the life cycle.

SUGGESTED IDEAS FOR ACTIVITIES

Adopt a tree

Quadrant and random plot studies

Take one animal and develop a food chain and effects of any breaks in the chain

Map location of trees; estimate age, amount of lumber, size,

Observe symbolic relationships

Animal census

Toothpick birds to show adaptation, camoflage

Collect and press flowers and leaves

Collect and mount seeds and insects

Make clue charts to aid identification

Leaf printing using spatter painting, potatoes, crayons, rubbings, clay

Take a nature hike

Build a terrarium or an aquarium

Listening to sounds and recordings

Nature through photography or sketching

Collect fossils

Stump exploring

Make a nature collage

Field trips to: a fish hatchery, a forest plantation, a zoo, a bird sanctuary, a farm, etc.

Build and observe a bird feeder

Tap a maple tree and make maple syrup,maple sugar, maple cream

Observe road side kills

Study the soil layers

Study decomposition

Study bird migration

Study animal homes

Collect spider webs

WATER AND WEATHER

The environment is in constant change. Environmental change affects people directly and indirectly. Environmental change follows certain patterns; these patterns have various time spans. Some of the most obvious occur in the atmosphere. There are many ways of measuring and studying these changes.

SUGGESTED IDEAS FOR ACTIVITIES

Use a garden hose to study erosion

Test the water for pollution, etc.

Air pollution partical collection

Make simple instruments for a weather station

Take a rain hike

Use weather balloons

Use ballons for air currents

Rocketry

Study stream velocity

Study siltage

Snowflake study

Study thermal pollution

Have a paper airplane contest

Study the effect of pressure on sound

Observe and sketch clouds

Make cloud mirrors

Make a "paint" farm

Make collapsed can barometer

Make and use Beaufort scales

Study echos

SOLAR SYSTEM AND BEYOND

The universe is infinite. It is in constant change. Within the universe theatre are: galaxies, constellations, star, nebulae, planets, moons, asteroids, comets, meteors, man-made objects, radio stars, pulsars, quasars, quarks, dark stars, and cophied variables.

The sun is the main source of energy. Activities of the sun affect us. solar storms, eclipses, auroras,calendars, moon phases, time, etc.

The moon and the earth can be considered as a double planet system - interdependent. tides, seasons, lunar day, navigation, time, etc.

Space has a fascination for man...legends, songs, stories, science fiction.

Activities

Build constellation viewers
Observe star patterns and seasonal changes
Record the phases of the moon
Use binoculars on a telescope to study celestial bodies
Observation of meteor showers and comets
Take a trip to a planetarium
Make scale model of solar system
Build pin hole cameras
Build and use telscopes
Construct a solar oven
Use prisms and make a spectroscope
Measure shadows at different times of the day, during equinox and solstice

Earth and its composition

The universe is in constant change. The earth is in constant change.

Man's study of the earth's structure has helped him to understand these changes in the past, in the present, and their future implications.

The study of earth's structure has revealed certain features such as layers of earth, magnetic fields, behavior of earth quakes and volcanoes, etc.

Oceans are the source of life and are an unexplored frontier. Soil is the basis of the community. The rock cycle, decay, erosion, etc. contribute to the soil.

SUGGESTED ACTIVITIES

percolation test
erosion study
delta formation
cross section of soil
rain hike
slopes at different elevations, similarities and differences
visit a road cut
fossils - collect and identify
soil temperatures
PH of soils and rocks
soil moisture and texture
collecting soil and rocks and identifying
examining materials under dissection scope
field notes of observations
clinometer to measure elevations
compass work
field trip - evidence of glaciation
field trip to quarry, beach or mine
field trip - building arts
new brick cimpared to old brick
sidewalks - new and old
expose limestone to elements for a whole year - compare with control
look under the playground equipment
heat rocks and drop into cold water
fry marbles and lenses
rocks in a stream

The middle school years are years of great physical and emotional change and growth. An understanding of the changes within himself is vitel to the middle school child.

All individuals have certain needs. These needs are established by the structure and function of the body systems.

Living together presents certain responsibilities towards family, peers, and the community.

Growing awareness of self leads to greater appreciation of the environment and dependence on responsibilities toward it.

Learning happens in many ways, from many sources, both directly and indirectly.

Environment effects the way individuals live, feel, and act.

There are constructive ways to use leisure time.

Death is a necessary part of life.

ACTIVITIES

Prepare a meal of health foods
Discuss safety in the outdoors: swimming, camping, etc.
Study large muscle activity through sports
Make a field trip to a farm
Observe the effects of physical activity on the body
How to use wild plants and animals for food
Compare and contrast insect metamorphisis to human growth
Measure height and weight differences in fall and spring by means such as shadows
Use playground equipment to develop muscular skills
Test water and air

WATER AND ENERGY

The universe is in constant change. Energy can be transformed but neither created or destroyed. Life exists because energy can be transformed. Life is negative entropy. Man has formulated certain theories and laws to explain and understand these changes. Matter exists in four states.

ACTIVITIES

How different woods burn, kindling temperature
Rocketry
Observe effects of lightning on a tree, etc.
Cross sections of hail
Catch and preserve snowflakes
Water and wind mills
Field trips to - electrical sub stations, power plants
Freeze water and observe effects
Observe effects of placing different colors of construction paper or cloth on snow and leaving for a time
Trip to construction site to observe insulation, heating, etc.

Trip to boiler room to learn how school is heated
Playground equipment as simple machines
Cabbage juice PH
Water testing
Friction - friction carts, various floors and waxes floor and grass burns
Tree splitting rock
Collapsing a can by air pressure (two ways)
Effect of heat and cold on volume of air using ballons
Beaufort scale
Test car exhaust for visible pollutants
Echos

PHYSICAL EDUCATION IN THE OUT OF DOORS

BY

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Physical education in and from the out of doors is the utilization of all natural settings to meet the major objectives listed below. It is imperative that we keep in mind that the child's major objective is fun.

General Objectives

1. Experience the joy and beauty of the outdoors.
2. Cooperate and share with others the satisfaction of achieving a common goal.
3. Achieve a working understanding with others by living with them.
4. Stimulate interests in the outdoors.
5. Develop skills which will enable one to cope with any unplanned happenings.
6. Develop activities which can be carried out throughout one's lifetime.
7. Provide a successful and enjoyable experience which will increase the students' desire to participate in an outdoor experience.
8. To incorporate strength, flexibility, endurance,balance, agility, co-ordination, physical fitness, psychological and social aspects.
10. Have the students realize that if properly dressed one can experience great joy in any outdoor activity.
11. Challenge students.
12. Experience success.
13. Develop on appreciation for creatures that live and survive in the out doors.
14. Realize special precautions that have to be taken to avoid casualties or even avoid fatalities caused by adverse weather conditions.
15. Learn skills that will enable students to travel successfully by foot during all seasons.
16. Live in harmony in the outdoors.
17. Safety.

MOTIVATION TECHNIQUES

Motivation devices are important in the program as a stimulant and can be tied in as a preparation activity. As a lead in, a film on hiking and camping, or if someone may have some slides showing particular areas you're going into, is a good interest

builder among the students. Guest speakers, such as a forest ranger or someone who is an authority on the location in which you are taking the students are helpful. Any students in the class who have had any hiking or camping experience also would be useful as a good indoor preparation.

The students may be able to make a scale model of a shelter they would like to stay in and then go out and try to reproduce the shelter. If tents are available, the students may be shown how to set them up as far as site, access to water and protection from wind and rain. The culminating activity before going out on the actual trip would be a day hike, receiving anything we had worked on up to that time. One important thing is that the students should feel that they have had some part in the actual planning of the trip.

SAFETY

1. The group leader should have complete knowledge of safety techniques in the outdoors.

2. Group leader will give directions pertaining to the area
   a) primary - safety can be taught through imitation of instructor.
   b) intermediate and secondary - students under the instructors guidance devise their own rules.

3. The instructor must be able to administer and enforce the necessary safety rules for his planned activity.

WARM WEATHER ACTIVITIES

Many things may be incorporated into a warm weather program. The students have a tremendous feeling for outdoor activities and the teacher may very well find an almost completely different child from the one he knows in the classroom. Most schools have and adequate outdoor facility where many of our games and activities can be enjoyed.

Before participating in outdoor activities there are many outdoor living skills that can be utilized. The motivation techniques named such things as firebuilding, shelter making, and day hiking. These can all be put into your main outdoor trip as lead up activities.

Once in the woods, safety is the first and most important thing to be stressed. Such things as staying with the group, keeping away from water, not eating anything they are not positive of and keeping away from dangerous places (cliffs, etc.) are very important.

Proper clothing is very important. For hiking, loose clothes for free movement are very important. Before entering the woods the footwear should be broken in to keep from getting blisters.

Good arch and ankle support should be stressed if at all possible and the shoes should have good tread on the soles. Two pairs of white athletic socks should be worn and an extra pair or two should be brought along and changed during mid-day or if the feet get wet. An extra pair of underwear should also be brought along. The pants should be loose fitting and of a durable quality. Dark colors seem to attract more bugs and insects than light. An undershirt is good to take. If going up an exposed mountain top, a wind breaker is good to have along. A baseball cap offers good protection for the eyes. If possible, a small day pack containing the extra socks, shirts, underwear, ponchos or raincoat, and first aid kit (include matches in it) can be taken along with the lunch and canteen or waterskin. Around the camp, an extra pair of shoes should be brought in to wear and warm clothes for sleeping should be with you.

Many things beside hiking can be done around the campsite. If there is a small pond or lake around, swimming, boating and canoeing can be utilized. This is an area where extreme caution and safety is a must. It would be a good idea to test each child's swimming ability and then determine whether or not he should be allowed to go in deep water to swim, to row a boat, or paddle a canoe. They should never go near the waterfront unsupervised. You should not over load, stand up or fool around in the boats. A swimming program should be set up for the non-swimmers.

Trails may be set up around the camp to follow using rock cairns or markers on trees. In an activity such as this, compasses may also be used. If at all possible, horses may also be utilized.

Many activities can be devised to compliment the above listed activities. The following games and activities can be implemented by using the materials provided by nature.

1. nature scavenger hunt

2. imitating insects or animals they see out of doors

3. creative movements inspired by trees, clouds, flowers etc.

4. spear throw - the pupils can prepare their spears by cutting saplings and using leaves as feathers as guides for spears. The contestants would compete for accuracy and distance.

5. shotput throw - the students can select rocks of different sizes

6. obstacle run - have students aid instructor in establishing a safe obstacle course. Rock cairns can be used to mark the course.

7. relay races - these can be on regular straight courses or through the obstacle course. The groups can carve their own batons.

8. broad jump - have pupils try to find a sandy spot or make a soft spot by digging out a hole and using leaves.

9. log carry - working in groups, students carry logs on their shoulders. Students can also participate in rolling logs with hands and feet.

10. tug of war - pupils can find vines and depending on strength of vines adjust the size of their group.

11. ring toss - the pupils can make their own rings from branches tying them with bark. Sticks are pushed into the ground for pegs.

12. pottsie - pupils can dig holes in the ground and select stones to toss in the pots.

13. compass course - groups follow given directions. First group to reach destination wins.

14. water boiling contest - team collects wood, builds fire and the first to boil water wins.

15. tent pitching - using small two man tents - set them up using speed and neatness as judging criteria.

16. hare and hound - hare (one student) is given ten minute head start. By leaving a trail of acorns, corn, leaves, etc. he is tracked and caught by hounds. Hounds may bark.

17. Activities
    a) walking
    b) games
    c) sports
    d) bicycling
    e) boating and canoeing
    f) horse back riding
    g) camping
    h) hiking
    i) swimming
    j) fishing
    k) following trail markers

WINTER ACTIVITIES

All or many of the following activities could be used right on the school grounds, rather it be rural or urban, as long as they have some kind of outside play ground area. Games, snow sculpturing hiking require no equipment at all. However the children

will learn that they must be properly dressed to enjoy the activities (waterproof foot wear, warm clothing, mittens, hat and scarf etc.)

In most rural areas one can find a small hill right on school property or very close by to provide tobogaming or sliding. Every one could enjoy sliding with very little equipment (cafeteria tray, cardboard box flattened, plastic sheet). A skating rink can be made on school property or most towns have a public rink that could be used.

These activities stress the necessity of proper fit of equipment. The students should learn the importance of equipment care and maintainance. They must also realize that these are different types of snow shoes for different snow conditions and terrain. They must also realize the difference in snow and weather conditions. Is it wet? Is it dry? Is it sunny, is it cold? This must be considered in waxing their skiis. These two activities may be used on both hilly or level terrain. They can be used in school grounds, a farmers field, a nearby wooded area or as a great activity for a field trip. Field trips allow students to observe nature in the winter at close range as well as enjoying exercise.

For sliding, skiing, snow shoeing, skating and hiking the class will realize the importance of light weight but warm clothing to enable them to move freely. They may want to add gators to their boots. They may also want glacier cream to protect their skin and glasses or goggles to protect eyes against sun glare.

If your winter activity takes you up a mountain they may learn that they would carry a light weight sleeping bag that protects against below zero weather in case some one becomes injured. They may want to wear long johns and tote an extra pair of socks and wind breaker. They will learn to pack a day pack that provides nourishment but is not heavy to carry.

If this trip is to be an overnight they will have to learn about waterproof, ligh weight equipment, equipment that is warm enough, how to carry and put on a heavier pack, dehydrated and high energy foods, and how and where to set up a winter camp. They should learn the importance of drinking plenty of liquid, salt, eating energy foods frequently and watch for signs of storms and what to do. They will learn that they must carry a light weight stove and fuel for emergency cooking in tent.

ACTIVITIES

1. snow shoeing
2. cross country skiing
3. winter hiking
4. snow soulpturing
5. polar bear picnic
6. tracking animals
7. ice skating
8. sliding or tobogaming

9. fox and geese
10. angels in the snow
11. squirrel in the tree
12. hare and the hound
13. cross country skiing
14. cross country snow shoeing
15. shuttle relay
16. hiding seek or tracking people
17. snow ball rolling contest
18. winter field events such as snow ball throwing for distane
19. fort or igloo building

These activities may all be incorporated into a winter carnival.

SUMMARY

Physical education in and from the out of doors has vast possibilities. One has only to look around him and use his or her imagination to utilize the limitless oppoptunities for learning in the great outdoors. To satisfy the objectives of the physical education program the activities must be geared to meet the physical and mental abilities of the group.

SENSORY AWARENESS THROUGH OUTDOOR EDUCATION

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"If facts are the seeds that later produce knowledge and wisdom then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow." So states Rachel Carson in The Sense of Wonder. The use of the five senses to clarify, define, explain, and perceive the environment must be developed very carefully in young children. Hammerman and Hammerman feel that an acquaintance with the earth is a basic aspect of a child's existence. Not only does each sense need to be separated from the others to be specifically studied and practiced, but each must be related to the others to further appreciate the world around us. In the end, after each of the five senses has been worked on separately, they all, or as many as possible, need to be tied together to solidify the meaning or value of each experience for the child. When a child is working with his senses, the situation he is in is one that fosters imagination, a willingness to try, to express his thoughts and feelings and to share them with others as an idea, an answer, a thought is rarely incorrect. Every thought and question of the child can be used, even if reworked, to make the experience more meaningful for all involved. Hammerman and Hammerman also state: "It is almost axiomatic in education that subject matter perceived by more than one sense will make a far greater impact on the learner." This brings to mind the old Chinese proverb: I hear, I forget; I see, I remember; I do, and I understand; and stresses the importance of using the senses in practical situations and exercises in the elementary school.

SENSORY AWARENESS

I. Definitions

A. Consciousness of our surroundings through the use of the five senses - taste, touch, sight, smell and sound

B. Perhaps Sammy Ives definition of creativity would apply. Redefine or reorganize, with insight, that which is known in to a product that the person who does it understands and is significant to himself.

C. Your definition after you have used the material here plus your extension of it.

2. Curriculum Enrichment

A. Concepts

1. Experience increases awareness.
2. Use of your senses can help you know the world about you.
3. Sensory awareness is a skill needed in all areas of life.
4. Enjoyment through the senses can be an end in itself.
5. Each individual sense should be developed to its fullest.
6. Sensory awareness is a motivating force for creativity.
7. Development of sensory awareness contributes to a positive self image.
8. Through sensory development you influence and improve the ability to catagorize and predict.
9. The out of doors is a textbook that children have fun learning to read. (a) The vocabulary may be rural or urban; (b) Teachers will enjoy teaching children the vocabulary; (c) Each page may differ in size and content.

B. Method

1. Period of motivation to spark interest.
2. Free the student so he can be receptive to the sensory experience.
   a) Take part in the activity with the students so they will feel comfortable.
   b) Use a few responses you are trying to elicit from the students.
   c) Don't name the birds, plants, trees, building types. Use descriptive words to call attention to them. (Look at this little feathery plant or look at that tall skinny building.) This technique will free the student to point out something he notices. It's all right if you don't know the particular name of the plant, animal, building or food you are sensing.
   d) Provide for a period of sharing
      1. How many sounds did you hear?
      2. Does this leaf have a smell when you crush it?
      3. How does the grass feel when you lie down in it?
      4. How does the grass look when you put your head down and look across the grass or through the grass.
      5. What was it like when you hugged the tree?
      6. What does the shape of the building, cloud, tree or flower remind you of?
      7. If you were a giant looking down from _____ what would you see?
      8. If you had x-ray eyes and could look beyond that big building over there what would you see?
      9. I wonder what this little fellow likes to eat? This type of question can not have a wrong answer. Even the most shy or the very tough student can be free to answer this type of question. He can be creative, he can learn, he can become sensory aware.
   e) Provide for an extension of the out door experience
      1. Reference material (The student can look up what he has included on the "clue chart" and identify what he has discovered.)
      2. Materials for recording or displaying samples brought back.

C. Experience

The following sections are examples of experiences that can be used to develop each of the individual senses. These lists may be expanded with your own interests.

TOUCH

1. Inside the classroom, have the children blindfolded and mitten and then try to identify objects placed on the counter or desk, remove mittens, repeat; remove blindfold, check identifications. Repeat this activity outside with common playground or yard articles.

TOUCH (continued)

2. At home, walk barefoot and blindfolded from room to room describing (to a following scribe) the changes in floor coverings and whatever else is stepped on including the dog's tail! Report to the class.

3. With a selection of materials gathered outside have the child gently stroke an object against the face of a second blindfolded child who must try to fully describe, but not necessarily identify, each object and the differences between objects.

4. Walk barefoot from sidewalk to grassy area. Describe changes felt by feet.

5. Sit with barefeet or hands dangling in running water. Fully describe all feelings and emotions.

6. Touch a tree blindfolded and write down every word or expression that comes to mind.

7. Walk barefoot along the bottom of a small shallow brook, trying not to look down at your feet too much. Describe what you feel (even pain).

8. Lay down on the grass, face down. Describe what your knees are feeling, what your tummy feels, what your toes feel.

9. Give a blindfolded child a box of assorted items gathered outside, several of several different textures. Have the child sort the materials into separate piles by feel.

10. Carefully clothed, lift your face, with your eyes closed, to a gentle rain. Try not to think, just feel. Then go inside and try to express your feelings and emotions.

SOUND

1. Trace the path of the sound. Where did it come from?

2. Twist your body in relation to the sound.

3. Hear some sounds on a continum loud to soft, high to low.

4. Pretend.

5. Theme words - harmony, change, etc.

6. If you don't know the sound and wish you did jot down what you can about the sound and look it up when you have access to reference material.

loud	soft	musical	distant	near	disturbing	pleasant	duration

These charts can and should vary.

SOUND (continued)

7. Stand in a given area and listen.
   a. Count the number of sounds you can hear. Close your eyes for a few moments.
   b. Cup your hand behind your ears (like Dumbo Ears) and then turn in a circle.

8. Tap on a wood pile with a stick or a stone. See if different size logs sound different.

9. Rub two blocks of wood together. See how they sound. Put glue on the blocks and dip them in sand. Rub them together when they dry. Glue various objects found on the playground and see if it changes the sound.

10. Take a small box out doors and try moving the box in various ways with like items in the box. Vary the size of the box, does anything happen. Vary the items. Vary the container. Use items found in a given area. Vary the size of the area if the activity is used more than once.

11. Acorn whistle. Blow across the cap of an acorn in a fashion similar to blowing across an empty bottle. Place the acorn between your first two fingers. Your fingers should cover a portion of the acorn. Place your nuckles to your mouth and blow. If you can do it you are a member of The Acorn Whistle Club.

12. Make Willow or Balsa Whistles. The directions can be found in many books, one source is Childcraft Encyclopedia.

13. Can you hear through the wood? Put your ear on your desk or a table and run your hand on the bottom surface of the board.

14. Sit still on a day when the wind is blowing in gusts. Can you tell when the wind is coming? Can you tell where it is going.

15. Take a tape recorder out doors and record the sounds that the class is listening to. Use these sounds in various ways when you come back to the classroom.
   a. Paint using various nature brushed such as flowers, grass, bark and many others that students will think of while they listen to the tape.
   b. Nature ballet
   c. Background for a skit (Put various objects on an overhead and cast them on a sheet. If you use fern, grass, branches, the effect is quite moving. This adds another dimension to go with the sound of the tape.)

16. Use figures of speech to give a new outlook on the sound.
   a. analogies
   b. metaphors
   c. similies
   d. allegories

TASTE

Of the five senses, hear, touch smell, see and taste; taste depends more on the other four than any other. A few examples will make this clear.

Would you ever: taste something that smelled bad.
taste something that looked terrible.
taste something that made noises.
taste something that wiggles when you touch it.

I have tried this with fourth graders and found this to be true. They want to first see, smell, touch and listen before tasting.

I will list some simple activities to develop the taste sense that can be used in an urban or rural area. Before trying any wild food plants check each one carefully with someone who is competent in that area. Some may be harmful.

1. Blindfold partner. Ask him to identify drops of different liquids by their taste. Place drops on tip, back and sides of tongue. May use lemon juice, sugar water, salt water, soda water, vanille in water, etc.

2. Blindfold classmate. Dry tip of tongue. Drop some sugar on the dry tip. Ask how tastes. Put water on sugar. Ask again. Use other materials such as salt, lemon drops, etc.

3. Blindfold and hold nose. Try to taste difference in orange, lemon and lime. Remove blindfold and place items to be tasted on different areas of tongue.

4. Blindfold, block nose and place thick mittens on hands. Give child something to taste and note the reaction when other senses are not used. Bring back senses one at a time til all are back.

5. Discover where bitter, sour, and salt and sweet tastes are on the tongue by using examples of each and placing them on areas of tongue.

bitter
sour salt sour
sweet

6. Try cooking some of the following things and see how the taste sense is affected by other senses.
   a. Acorn
   b. Sunflower
   c. Common Milkweed
   d. Cray Fish
   e. Frog lets

Again check with someone in the know before trying any of the above. Make sure you do have the item you intend to try.

Acorn Meal - grind dry, raw acorn kernels, mix the meal with boiling water and press out the liquid through a jelly bag. Spread the meal thinly in shallow pans and dry in the sun or in a very slow oven. Use to make bread

Sunflower - Run seeds through a food chopper with small hole plate that prevent the seeds from going through whole. This cracks shells. Pour cooked mixture into water and stir. Hulls float to top. Kernels on bottom.

Common Milkweed - Young shoots, up to six inches high, make a very passable vegetable to serve like asparagus, the newly opened leaves can be served like spinach, the unopened flower buds are eaten like broccoli, the young pods are eaten cooked like okra.

Crayfish - Drop into boiling water until bright red. Shell out the meat in tail and eat it. Or shell out tails in corn meal and fry them.

Frog's Legs - Fry them like drumsticks of chicken.

For many many more ideas on cooking from the wild read Stalking The Wild Asparagus by Euell Gibbons.

SIGHT

The following are only a few of the many possibilities to be used in the out of doors to develop the sense of sight.

1. Lie down on the ground and observe all that is above you. Note variations in color, size, and shape of clouds, trees, buildings, birds, etc.

2. Confine an area of ground (with a hoop shaped hanger) and observe everything in that area. Compare and contrast with other areas of similar size.

3. Find objects that are similar, examine and note differences. For example stones, cars, clothes, insects, mosses, flowers, etc.

4. Stand in a wooded area and count different trees. The children can predict the number they expect to find before doing the counting. This could also be done using a parking lot or other non-wooded area.

5. Observe a place, plant, or animal over a period of time. Note changes in shape, size, color, composition, and surrounding area.

6. Dig some plants and note relationship of roots and stems, size color, use to the plants.

7. Make measurements of temperature at different depths in the ground or water, note relationship of depth and temperature.

8. Make a perculation test by putting a large tin can minus top and bottom into a dug hole. Press firmly into the ground, pour a measured amount of water into the tin and time the rate of absorbtion. Make conclusions about the drainage of the area.

Sight (continued)

9. Measure children's pace using a 50' tape on the ground and walking its length twice, and dividing by the number of steps taken in 100'. Estimate distances between objects by pacing off.

10. Observe erosion patterns in school, home, or shopping areas, and have children devise solutions to problem areas.

11. Observe the life structure in an ant farm.

12. Examine objects with a magnifying glass; through a prism.

13. Observe things from different points of view, an ant, a tree, a house, etc. Become a tree, ant, house, etc, and write an account of a day's experience.

14. Observe traffic patterns, types of cars, etc.

15. Imagine different types of vision: x-ray, magnifying, looking through a compound eye, etc.

SMELL

The following is a list of several activities making use of the sense of smell that can be used in a rural or urban setting.

1. Crushing leaves and breaking off stems to release the scent of the plant, for example, catnip, mints, clovers, and any non poisonous plant.

2. Wild flower walks or visits to gardens just to use the sense of smell to enjoy the flowers.

3. Cracking open nuts, seeds, berries, and pine cones.

4. Smelling the barks and the woods of trees

5. Have children bury their faces in the grass and just breathe in the smell of the grass.

6. Break open a decaying log on the forest floor to see the differences between a plant that's building up and a plant that's breaking down.

7. Odors are often the evidence of the presence or passing of animals. Skunks, some snakes, wet dogs, etc. all have distinctive odors. What is the reason for this? Also, droppings of animals which can be detected by smell are evidence of them.

8. The smell of the air can tell us many things: rain is coming, we've just had a shower, someone has mowed their lawn or cut their field.

9. The quality of the air in cities can be detected by its odor. The presence of the various pollutants can even be determined.

Smell (continued)

10. Gather samples of pleasant smelling leaves, flowers, and pine needles for making potpourri or sachets. In making potpourri use a jar, perferable stoneware. Alternate layers of fresh flower petals and leaves with layers of a mixture of spices (cloves, cinnamon, nutmeg, orange and lemon peel). For making a sachet, dry the flower petals and leaves on a screen. Then stuff a small pillow or pouch with them. Put the potpourri jar in a stuffy closet and the sachet in a drawer, chest or trunk. The scent spreads to the clothes, linens, or whatever. These natural fragrances are always there then to awaken memories of summer days in a field of flowers or a piney woods.

LEARNING SCIENCE IN THE OUT OF DOORS
K - 4

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Course

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Program planning for the Classroom Teacher

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INTRODUCTION FOR SCIENCE K-4

In this project for Outdoor Education we will cover the grade range K-4 by activities, games, observations and experiments. The children will learn through their own discovery following a discovery guide which is an aid to individualizing inquiry. It avoids confusion. The talking by the teacher is reduced to a minimum allowing for individual attention to the child.

OBJECTIVES OF DISCOVERY GUIDES:

1. To foster the natural curiosity which children have about the world around them.

2. To guide children to learn about their environment out-of-doors by getting them involved in the process of finding out for themselves.

3. To give children a chance to appreciate science as a method of discovery through solving problems.

4. To emphasize the ecological approach by including studies in the physical and biological aspects of the environment.

5. To help foster the kinds of attitudes and appreciations which lead to understanding the scientific method and its applications.

6. To stimulate interests and to develop skills which enable children to investigate for themselves.

7. To develop an understanding of the out-of-doors which may lead to interesting hobbies of various kinds.

8. To create an awareness that our resources are not restricted to soil, forests, fish and wildlife; but that they also include peace, quiet, clean air, clean water, space and beauty.

9. To lead children to the enjoyment of the esthetic beauties in the outdoors and to explain the privileges and duties each one has to make it possible for others to obtain the same enjoyment.

10. To appreciate conservation as it develops from an understanding of the ecological interrelationships in our environment and to recognize that man is part of this "web of life."

LIVING THINGS - OBJECTIVES

KINDERGARTEN

The student will be able to:

1. identify that all things are either living or non-living.
2. identify living things as plant or animal.
3. identify all living things grow.
4. state that all living things are not the same size.
5. identify that there are many kinds of plants and animals.

FIRST GRADE

The student will be able to:

2. state that there are many kinds of plants.
. state that plants gorw in a variety of places.
3. state that plants and animals need food, air, water, and favorable temperature to live.
4. state that green plants need light to grow.
5. state that most plants can not move about as animals do.
6. state that there are many kinds of animals.
7. state that animals live in many kinds of places.
8. state that most animals can move from place to place.
9. state that animals move in different ways.

SECOND GRADE

The student will be able to:

1. identify the parts of a plant.
2. identify that living things change as they grow.
3. state that some animals move from place to place with seasons in order to find food.
4. state that seed dispersal is essential for plant reproduction.
5. identify living things in soil.

THIRD GRADE

The student will be able to:

1. state that many plants and animals are adapted to living in certain kinds of places.
2. state that many animals have special adaptations which protect them from their enemies.
3. state that man depends on other living things for his food, clothing, and shelter.
4. state that man should exercise good conservation practices so as not to disrupt the interdependence of living things.

FOURTH GRADE

The student will be able to:

1. identify the parts of a flower as stamen, pistil (ovary, seeds), petal, sepals.
2. state that some plants have seeds.
3. state that seeds are produced by flowers.
4. state that seeds are distributed by explosion, wind, water, and animal.
5. state that fruit develops from the flower
6. state that green plants make their own food.
7. state that new plants can be grown from seeds, leaves, and stems of other plants.
8. state that some animals feed and protect their young.
9. identify the five groups of vertebrates.
   a. fish b. amphibian c. reptile d. bird e. mammal

LIVING THINGS - ACTIVITIES

K-2

1. Take a walk around the building during the spring to collect tree seeds. Observe differences in sizes and shapes.

2. Collect branches bearing unopened fruit of witchhazel in the fall. Keep these in a warm classroom. The witchhazel will pop its seeds-showing method of seed dispersal.

3. Sketch and describe specimens observed and then classify these upon return to the classroom using visual characteristics. One student from each group might be permitted to collect one specimen.

4. Find living and non-living things.

5. Listen for sounds which living things make.

6. Investigate a dead tree to find out how it feels, smells and looks. Look for scars, breaks, holes, and for plants and animals on it and in it. A fallen rotting tree is examined in the same way. (Do not break rotting log apart. Replace whatever is moved.) Students may justify its value to the environment.

7. Look for animal homes at different levels of the forest or field (ground level, eye level, and overhead) as well as by the holes, spittle bug foam, webs, rolled leaves, cocoons caves, muskrat mounds, and beaver lodges.

8. Study the different in bark textures by feeling with fingers. Make rubbing of bark in order to compare designs.

9. Observe and feel differences in other parts of plants, leaves, trunks, twigs, root, flowers, and branches.

10. Look for animal coverings to study. Perhaps rabbit, snake, frog, salamander, bird, insect or earthworm.

11. At the edge of a pond use a strainer to scoop up some bottom mud which is then placed on newspaper. Living things are then transferred to basins of water where they can be more clearly observed. Overturn a few rocks to find life under them. Try to get life from a stream where there is running water to compare life from the two places.

12. For sight, touch and smell, introduce two different leaves, such a sassafras and mullein. Sassafras has 4 different shapes, is smooth,and is fragrant when crushed. Mullein has a simple outline, is not especially fragrant, and is very fuzzy. Listen to the sounds made by walking on leaves, the calls of birds, running stream, splashes of animals, sounds of animals.

13. Give each child a copy of some leaf shapes and then look for the matching shape outdoors. When the child finds a match, he may fill in the outline with crayon.

LIVING THINGS-ACTIVITIES CONTINUED K-2

14. Look for evidence of animals using plants for food.

15. Notice which parts of all plants are green.

16. Find what happens to the roots of a fallen tree, to the hole left by the fallen tree.

17. Find evidence of change taking place on some of the rocks.

18. Find evidence fo roots of plants keeping water from washing soil away.

19. Find what lives in water, the woods, the soil.

20. Making two teams, have students go out and find the lack of grass in certain places.

21. Take a hoop or coat hanger and throw randomly to observe within loop area the different kinds of seeds and how they spread.

22. Send search parties of two or three children to find as many different types of mushroom, lichens, fungus and algae as they can.

23. Have children find as many different types of galls as they can.

24. Have students count as many birds as they can in a certain time.

25. Taking containers with them, have students collect as many kinds of insects as they can and observe their behavior.

26. After observing plants have class tell in which direction they grow.

27. As an art project have each student select a different shape tree and then draw it from memory.

28. Have the class gather all materials they feel are polluting the area you specify.

29. Compare several flowers. Look for the same color, different colors. Look for the parts that are the same color and the parts that are different color.

LIVING THINGS - ACTIVITIES

4-4

1. Plant a flower or vegetable garden on the school grounds.

2. Collect mushroom and ferns to show spores.

3. Find fungi of various types and notice where they are growing. Compare these places with places green plants grow.

4. Obtain green pond scum and observe drops under a microscope or bioscope.

5. Make fern leaf prints in plaster of paris.

6. Look for immature insects in various land locations - near the water, in the woods, in the field, and along the fence rows and roadside. Look for caterpillars hanging from trees, rolled up in leaves, inside galls on various parts of plants.

7. Divide children into small groups to explore carefully a portion of the area under study. They can look for changes in plants such as rolled leaf edges, galls, holes in leaves or the tree itself; changes in the physical environment such as decreased sunlight in an area, holes in the ground or flooding of the area.

8. Find different stages of growth in insects, frogs, and toads. Obtain samples from bottom mud and water in a pond.

9. Let children work in groups while exploring an area for living things.

10. Observe the differences in mature and immature trees--bark texture, size and shape of leaves, color of twigs and bark, shape and and height of the tree. Notice the leaf canopy of the tallest trees in contrast to the lower branches. Bark rubbings of older and younger barks are apt to be smoother than older ones; contrasting rubbings which show trees grow in width as well as length. Growth in width causes ridges, cracking and peeling.

11. Use different methods of telling the age of a tree. Count the whorls of branches on pine trees, the annual rings of a tree cross section and the growth rings or bird scale scars on branches of deciduous trees. Current growth being the distance between the terminal bud and the nearest set of "growth rings." Measure the distance between these growth rings and the next lower set for previous year's growth.

12. Let children select two twigs which are two years or older. They measure and record the amount of growth for the present year and the last year. Determination can be made as to which year showed the most growth and discuss the reasons for different growth rates from year to year.

13. Take precounted toothpicks of assorted colors and scatter them in the grass. Have children try to pick up as many as possible in a given time limit. Observations can be made as to what color toothpicks are most difficult to locate. Try this same activity in a drier area, perhaps a meadow or field and carry on the same observations. Discuss camouflage and protection again in regard to findings. Find insects which are the same color as the place they are found.

14. Look for evidences of animals in the woods. They might be tracks, eaten nuts, spider webs, nests, the sounds of animals, their droppings, etc.

15. Examine soil and notice it is made up of broken down parent rock, decayed plant and animal material, live organisms, water, and air.

16. Working in groups the children can work in different areas (evergreen woods, field, deciduous woods, school yard) to examine soil samples. Later they can use soil samples to create dioramas of the area from which they were taken.

17. Find the diameter of a tree by use of a tape which has been marked off in 3 and 1/7th inches and each section numbered by ones. Wrap the tape around the tree trunk 4½ feet from the ground. Where the tape meets, read the number. This represents the approximate diameter of the tree.

18. Locate plants which should be avoided.

19. Look for nests, and notice the number of nests in one tree.

20. Watch birds to find what kinds of plants seem to attract them.

21. Observe animals on, in, around and under a stump and notice what they are doing.

22. Observe the shape and color in animals and relate this to the survival of the animals.

23. Examine some plants in order to find the beginning of next year's plant and notice the location of these parts.

24. Try to locate cocoons, spider egg cases, praying mantis cases, earthworm egg cases and watch their development, etc.

25. Compare the temperature of several animal homes for the warmest and coolest.

26. Compare the living conditions of plants and animals on top of a rock and those under a rock.

27. Examine plants in order to find out how they protect the soil.

AIR, WATER AND WEATHER - OBJECTIVES

KINDERGARTEN

student will be able to:

1. state that air is all around us.
2. state that we can feel air but we cannot see it.
3. state that we can see what air does
4. state that air can warm us or cool us.

FIRST GRADE

The student will be able to:

1. identify that winds move at different speeds and from different directions.
2. identify things that wind can do which are beneficial, harmful, or both.
3. identify the forms of precipitation
   a. rain b. snow c. sleet d. hail
4. identify that weather affects our work and play.
5. identify that clouds have different shapes.

SECOND GRADE

The students will be able to:

1. identify the different places temperature is measured.
2. state that water evaporates from puddles, lakes, and oceans to go into the air.
3. state that there are different types of clouds and that they change color, patterns and speed.
4. use a rain guage.
5. state that rain effects the plant and animal life.
6. state that wind has different strengths and may blow from any direction.
7. state that temperature differs in contrasting areas.

THIRD GRADE

The students will be able to:

1. state that wind effects animal life.
2. state that a volume of snow melted will produce a lesser volume of water.
3. state that there are different forms of clouds.
4. identify difference in snowflakes and compare size and shape.
5. state that the earth is heated unevenly by the sun.

FOURTH GRADE

The student will be able to:

1. state that some precipitation soaks into the ground while some runs off into streams, lakes and oceans.
2. state that excessive precipitation causes great damage by erosion and flood.

3. state the condition of a swamp.
4. state that the water table is higher in the spring than in the fall.
. determine wind conditions and velocity.

AIR, WATER AND WEATHER - ACTIVITIES

K-2

1. Have students record rainfall by making a rain guage and keeping a record over a period of several weeks.

2. Have students keep records for several days of the kinds of clouds that are visible. Discuss changes of color, patterns and speed.

3. Have students observe the effect of rainfall on the plant and animal life. Discuss the problems created by rain and also the helpful effects.

4. Children can find many examples of temperature differences outdoors. The following areas of contrast may be used.
   a) sun-shade
   b) wind-calm air
   c) deep water-shallow water
   d) snow surface-under pile of snow at ground level
   e) snow-ice
   f) surface soil-subsoil
   g) edge of water-middle of meadow

5. In which places around the building does the wind blow strongest can be a matter of research.

6. Find the coolest spot on a warm day; the warmest spot on a cold day.

7. Feel the surfaces of different types of objects and notice whether color of the object makes a difference. When doing this record the results for warm days and cool days. Compare.

8. Draw a circle around the very edge of a puddle with a piece of chalk or mud. Watch to discover how long it takes to disappear. Try this on sunny days and cloudy days to compare time element. Try it on relatively calm days and windy days and compare. Discuss what happens to the water.

9. Make wind strips with strips of plastic for observation of wind velocity--both for strength and direction at various parts of the school environment.

3-4

1. Have students study and record wind conditions for several weeks--use direction of the wind and the accompanying weather conditions and temperatures. Make a simple wind van and anemometer.

3-4 (continued)

2. Have students investigate snow volume in comparison to water volume of the same melted snow by using some fruit juice cans which have been filled with snow, placed in warm place to allow snow to melt and resultant water volume measured. Let children calculate how many inches of snow would produce one-inch depth of water, or how many inches of snow will be produced by the snow in the juice cans. Try different textured snow, snow packed down or placed lightly in the can. Note results.

3. Make daily observations of clouds. If a camera with a filter is available, cloud photographs can be taken and developed into an excellent exhibit.

4. Examine snow flakes which fall on dark clothing with hand lenses. Note their shapes, number of points.

5. Arrange a trip to a reservoir, or to the source of the school water supply. If appropriate, have the school custodian interviewed for what happens to the water to make it ready for use in the school.

6. Find places in the vicinity of the school where there is evidence that the water table is near the surface. Swampy or marsh locations can usually be found at a distance not too far away. Children should be led to observe the difference in the vegetation as compared to adjacent drier areas. In early spring it will often be possible to find the water table by digging a small hole with a shovel.

7. Arrange to take a trip to an airport or local weather bureau to observe the wind sock and the wind speed indicator (anemometer). Discussion can be held as to why the people at the airport are interested in the wind speed and direction, the weather bureau is interested in both, too.

8. Have the children find a place in the direct sunlight where a blacktop surface meets the lawn. Have the children place one hand on the paved surface and the other hand on the grass. Discuss which area is hottest, whether the sun heats all parts of the earth equally or not.

9. Go to a nearby weedy field on a windy day. Have the children lie down, face up, and see how hard the wind blows against their faces. Have them kneel with their faces even with the tops of the weeds. Let them stand. Discuss where the wind is the weakest, the strongest, where the insects might go on a windy day.

EARTH AND ITS COMPOSITION - OBJECTIVES

KINDERGARTEN

The student will be able to:

1. identify rocks/stones as hard non-living things.
2. separate rocks/stones into groups according to:
   a. size b. color c. shape d. texture
3. identify that there are different kinds of rocks/stones.
4. state that rocks/stones are used to make things.
   a. as building materials
   b. in many ways around the house and in schools
      1) Stone which is used to building things is strong and hard.

FIRST GRADE

The student will be able to:

1. identify that the land on which we live is made of rock and soil.
2. distinguish the difference between soil and sand.
3. state that there are different kinds of soil.

SECOND GRADE

The student will be able to:

1. identify the ways in which rocks are constantly being worn or broken down.
   a. wind b. water c. temperature change d. plants e. man
2. state that the soil contains bits of broken rock and decaying plant and animal matter.
3. show that soils differ in their ability to hold water.
4. state that the top soil is a valuable resource and should be conserved.

THIRD GRADE

The student will be able to:

1. state that the surface of the earth is constantly changing.
2. identify the examples of earth's changes.
   a. building up and wearing down of mountains and hills.
   b. delta, gully, valley formation
   c. changes in coastlines
   d. landslides
3. identify the factors responsible for these changes.
   a. wind and water erosions
   b. man and other animals
   c. glaciers
   d. gravity
   e. earthquakes and volcanoes

FOURTH GRADE

The student will be able to:

1. state that fossils are evidence of life in the past and may be found in sedimentary rock.
2. recognize fossils and fossil imprints
3. state that there are different kinds of fossils
4. identify two examples of sedimentary rocks
   a. limestone b. shale c. coal d. conglomerate
5. identify two examples of metamorphic rocks
   a. marble b. quartzite

EARTH AND ITS COMPOSITION - ACTIVITIES

K-2

1. Collect some rocks from around the neighborhood. Compare the rocks collected with the man-made materials (rock-like) used in construction.

2. Have the children use lemon-juice or vinegar for testing reaction of rocks. Try to include limestone so that there will be a bubbling reaction.

3. Examine natural rocks found on school site. Discuss and group rocks according to size, color, shape, texture.

4. Take a trip to visit a stonecutter. Notice what kind of stone he uses and the tools used to cut the rock.

5. Go outside after a rainstorm and find areas where water is standing on the earth. Discuss the differences in the kind of earth which held the water on the surface and that which allowed it to sink into it.

6. Visit areas where the soil has been moved by rainwater. Observe the evidence of miniature gullies and ditches, transported sand and other examples of erosion.

3-4

1. Locate limestone and examine it closely with the aid of a magnifying glass. Sometimes tiny shells can be seen. Test the rock with vinegar or lemon juice and notice the reaction. Try the same test on other rocks and compare the reactions.

2. If in an area where marble is found, try testing with vinegar and compare its reaction with that of limestone.

3. Take a trip to a museum where displays illustrating physical features and changes of the earth are exhibited.

4. Arrange a trip to a nearby area which shows evidence of glacial features and deposits. In large cities such evidence can often be found in parks.

5. Visit sites which are under construction and see rock exposures. Sometimes they provide a source for rock and mineral specimens.

6. Visit a place where building stone is quarried to find out kind of rock, uses of the rock, methods of quarrying.

7. Gravel beds or banks may provide another place to collect specimens.

8. A fossil-collecting trip may be possible in some areas.

HIGH SCHOOL SCIENCE IN THE OUT DOORS

BY

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Course

Ed. 515 Outdoor Education
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Definition - The subject of this project is high school science which includes numerous subject areas. Since we are limited with only three people, we shall focus on Earth Science, Physics and Biology. We hope that a more thorough treatment of these areas as well as the many other subjects of high school science will be assembled in the future. A plethora of ideas and materials are available but their assemblege in a series of phamphlets which could direct us to them would be very desirable.

As you may already realize there are a number of fields of science that, in the evolution of specialization, have come to focus on particular aspects of the natural earth, its processes, and its environment. Despite specialization, many threads, both in subject matter and method of investigation, continue to bind the several fields together. The cementing agent is the earth itself.

There is a great need for more emphasis upon the teaching of the earth and its environment in the outdoors. There are all the worthy reasons such as re-enforcment of classroom learning, motivation and enjoyment. but my belief is that outdoor learning is the best means of teaching our children, in fact all ages, an awareness of the importance of our natural world. It will be through the efforts of many such "aware" people that the problems of our environment shall be solved.

The following are quotes from three famous men.

"When you try to make everything clear by reason, you somehow only succed in making everything confusion. Once you introduce a single mystery, everything else becomes clear in the light of that one mystery."

Fulton J. Sheen

"Love all God's creation, both the whole and every grain of sand, Love every leaf, every ray of light. Love the animals, love the plants, love each seperate thing, If thou love each thing thou wilt perceive the mystery of God in all; and when once thou perceive this, thou wilt thenceforward grow each day to a full or understanding of it: until thou come at last to love the whole world with a love that will then be all-embracing and universal."

Fyodor Dostoevski

"The most beautiful experience we can have is the most mysterious. It is the fundamental emotion which stands at the cradle of true art and true science. A knowledge of the existence of something we cannot penetrate, our perceptions of the profoundest reason and the most radiant beauty, which only in their most primitive forms are accessible to our mind - it is this knowledge and this emotion that constitute true religiosity; in this sense, and in this alone, I am a deeply religious man."

Albert Einstein

You'll notice that all these men speak of mystery - that intangible feeling that nature so readily gives us. If, indeed, it is the most beautiful experience we can have, then this in itself is enough reason for teaching in the out-of-doors.

Concepts - The following concepts are paraphrased from the behavioral themes of the Earth Science Curriculum Project, which I believe are excellent when dealing with all sciences. The first theme concerns science as inquiry. The body of scientific knowledge at any given moment represents only one stage in man's efforts to understand and explain the universe. Today's useful theories may be the half-truths of tomorrow. In this approach, science is presented as inquiry, as search for new and more accurate knowledge, At times we should focus on the frontiers of scientific knowledge where unsolved problems still abound - the intellectual new horizons of the modern world of science.

The second theme is the comprehension of scale. In science we can help the student develop concepts of scale in the real world andin models, and develop skill in devising and using models.

The third theme is the prediction of processes and results, relationships, and future events, which is one of the goals of most scientific inquiry.

The conceptual themes include the following.

1. Universality of change - The earth is a dynamic planet. Nothing about it is truly static, and none of its features will endure.forever. Materials and life on this earth are constantly undergoing change.

2. Flow of energy in the universe - The universality of change in earth materials results from continuous redistribution of energy. Energy in a system tends to dissipate, and a gain in energy can occur only if more energy is supplied to the system.

3. Adjustment to environmental change - All matural systems tend to move toward a state of equilibrium. Opposing forces in a system cause reactions that ultimately bring about a dymanic balance. Stress applied to a system a equilibrium causes change that tends to neutralize the effect of the stress.

4. Conservation of mass and energy in the universe - The sum of mass and energy in the universe remains constant. Interactions in nature result in transformations of energy from one form to another and in transformations of matter to energy and vice versa.

5. Earth systems in space and time - Understanding almost any aspect of the earth requires considering the physical, chemical, and biologic nature of its parts and their relationship among parts of the whole must also be estabolished. All matter exists in time and space and is subject to changes that occur at varying rates and in varying patterns.

6. Uniformity of process: a key to interpreting the past - The fundamental physical processes and chemical reactions operating today are assured to have operated throughout earth history.

In order to have these themes attained, it must be remembered that the activities must be student-centered, Each student must be an active participant - observing, measuring, interpreting, and discussing, Do not rob the child of his opportunity to investigate for himself. If the student is to come to grips with his environment and to understand it, no amount of reading and talking can take the place of observing and investigating. We do not want the student to be merely an absorber of facts. We want him to be enthusiastic and curious about the world in which he lives.

Earth Science

A. Definition. Some science topics included in Earth Science, and in this outline, are as follows: weather and climate, the atmosphere, geology, seasons, structure of the eath particularly processes that shaped earth's surface, solar energy and its conversion to other forms of energy, modification of the environment, celestial observations.

B. Concepts. Only a few concepts relating to Earth Science are included here, while others will readily occur to an Earth Science teacher as being suitably taught by outdoor experiences. The numbering system here is related to the numbering system in part C of this outline,

1. Observations involve the interaction of the senses with the environment, and can be extended by use of instruments.

2. Many earth processes reflect cyclical changes.

3. The characteristics of a position can be measured and described.

4. The sun is the major source of energy which drives earth systems

5. Change is a natural state of the environment.

C. Outdoor activities suggested for curriculum enrichment in the above concepts.

1. See Concept 1 above:
   a. Throw a hula hoop on the ground any place and ask members of a group of no more than four students to make observations of the enclosed area, using their senses only.
   b. Have students close their eyes and feel of tree trunks; then describe or compare the various trees. Do the same for leaves.
   c. When outdoors ask: How many colors do you see?
   d. Observe a mud puddle or area of pavement and ask, "What is happening here?" After visual observations have been made bring out thermometers, meter sticks, cameras for time-lapse photography, or make artificial puddles either for controls or to show layering or run-off patterns.
   e. From any outdoor observation point ask students to classify things they see as solids, liquids, or gases.
   f. Calculate: Distance walked, width of a stream, height of a tree or its diameter or circumference.

2. See Concept 2. above:
   a. Regarding the water cycle, over a period of several hours or days observe (and measure if possible) changes in amount of moisture in available outdoor areas: surface water such as on sidewalks or streets; puddles; relative humidity of air; level of streams or ponds; types and persistence of clouds.
   b. To understand seasons, plot the positions of the sun each hour on these days: Sept. 20, Oct. 20, Nov.20, Dec. 22, etc. preferably using a transparent plastic hemisphere.
   c. Look for evidence of layering in rocks, particularly near roads cut through hills and try to determine the sequence of events that occurred in the area.
   d. Visit a cemetery, The nature of tombstone, with their dates, allows study of weathering rates.
   e. Search outdoors for exanples of evaporation and of condensation, the processes which make up our water cycle.
   f. Record changes that occur while you watch; example, formation or dispersion of clouds.

3. See Concept 3 above:
   a. Using air thermometers take temperatures at ground level, 10 feet high, and 20 feet high; also higher if it can be done away from building.
   b. If there is a pond nearby, get temperatures at bottom, at various depths, at center and edges of the pond. Graph results with temperature on the vertical axis and depths on the horizontal axis. Try to devise more and more accurate ways to obtain good results.

c. Take measurements of land levels and derive a contour map of any nearby land or of school grounds. A model in a shoe box can also be made of the land form.

d. On a clear evening help the students orient themselves when observing the sky, using star charts for the apporopriate month. Observing the sky, using stars at different times, measuring vertical angles if instruments are available; otherwise estimate them. Some shift of postion should be detectable for all stars within a two-hour period, except Polaris of course.

e. Observe moon's path over several months. Estimate future positons of moon during full, quarter, and new phases.

f. How many different kinds of rocks can you find along a pond edge?

4. See Concept 4. above:

a. Using a simple handmade spectroscope aim the slit toward the bright sky and sketch what is seen using colored pencils.

b. Next add blue and/or red cellophane over the slit while pointing the spectroscope at the sky.

c. Search for examples of conduction, convection and radiation outside the classroom building.

d. Try to determine which kinds of soils or stones or building materials or pavements absorb or lose heat the quickest.

e. At different times of the year have students determine the altitude of the sun at high noon and the earth temperatures at the same times. Draw some inferences about the results.

f. Weather watch: using homemade and/or purchased instruments for student observations they can graph the more important daily weather variables.

g. Search for examples in the immediate area of greater energy consumption than there is energy production. Remember the amount of energy is reduced with progressive consumption. Example: A field producing eight tons of grass per year may sustain a 1,000 lb. cow for a year, and 500 usable pounds of that animal may sustain a man weighing 200 pounds for one year. *

5. See Concept 5 above:

a. Find samples of topsoil and of subsoil; then try to generalize effects of weathering on the parent rock.

b. Try to find rocks that have been transported and speculate how the transportation took place.

c. To familiarize students with local rock typed, try to find and distinguish between sedimentary and non-sedimentary rocks,

* This example taken from speech by Dr. John Weeks, Aug.14, 1972.

d. Find evidences that people or other animals have caused changes in earth's crust.

e. In a given outdoor area try to predict the scope and direction of change during the coming week; during the next month.

f. In the immediate area of the school detect the nature of pollutants being added to the environment, and how they vary with time of day or seasons.

Physics

Science as defined in Webster's Dictionary is a "systemitized knowledge of nature derived from observation, study, and experimentation." It is one way of solving problems dealing with nature. It is not the only way, but on which orders facts in a way which can be used to solve othe problems through the use of reason. Physics is a part of science which deals with the properties, changes, and interactions of matter and energy. It does not deal with life forces and partially deals with chemical bonding. However this is thoroughly covered in chemistry and not dealt with here. Physics is generally broken down into eight or more areas. These usually include at least the following: Mechanics, Thermodynamics, Electricity, Magnetism, Sound, Light, Astromony, and Atomic Physics.

The limitations of physics are the same as that of all sciences. They are the limits of observation, of experiments, and of reason.. We are limited in observation by our senses and our size, The eye can only see something so small or so large. We can only hear so faintly. Even instruments are limited in their presision. We are also of a particular size and cannot get to some places we wish to observe firsthand. We cannot look directly at atoms and we cannot visit the faraway planets and stars. There is also a limit on the objectivity of our information. At some point and on some level the observer becomes part of that being observed. Therefore the objective nature of observation is limited to that extent.

We are also limited as to the number of times and different ways we can do our experiments. A theory is never totally correct or incorrect as long as every conceivable experiment has not been carried out. This is impossible to do for any theory.

Finally we are limited by reason itself. Man's ability to make judgements and to use his imagination put limits on every idea and on every theory. In some cases reason itself can no longer be applied when we reach the limits of reality and our ability to think. These then are the limits of physics.

In the study of any subject one must be acquainted firsthand with that which one studies for any real learning to take place. This is in particularly true in the case of science and physics. Nature is our field of study. To study it you must experience and experiment with nature. This is the only way to real learning.

It can partially take place within a classroom but to get the real feel for nature and the world you must be outdoors. Any cirriculum not taking advantage of the outdoors. can only be partially successful at best.

Physics Activities Outdoors

The following is a list of different activities I thought might be useful in teaching various aspects of physics outdoors. The list is by no means complete and one with a stronger imagination than myself could probably think of many more. There are two types of activities listed. There is the demonstration-explanation type and problem solving.

Demonstration-Explanation

1. Using rocks on hills to demonstrate potential energy. Roll down hills.
2. Demonstrate conservation of energy in cycle or rain.
3. Show conservation of energy in trees and growth and death.
4. Demonstrate gravity in how objects collect at various places on hills.
5. Drop stones off cliff and show relation of mass to gravity.
6. Demonstrate center of gravity using trees, sticks, rocks, etc.
7. Visit an electric plant to see how power is produced.
8. Demonstrate wave principles on pond or lake.

Problem Solving (Can be used as demonstration also)

1. Measure energy or wind. Build windwill
2. Measure energy of stream. Build water wheel.
3. Try to determine speed of bird in flight.
4. Try to develops a formula for gravity by dropping thing off roofs or cliffs and timing their fall.
5. Use automobiles to do problems of speed and acceleration.
6. Try to discover why a fly walks on the ceiling.
7. Make a power generator at a small waterfall.
8. Do problems of physics textbooks outside to help visualize them better.
9. Find amount of friction in sliding a board across the ground.
10. Try to discover what centripetal and centrifugal force is with materials outside.
11. Have kids try to demonstrate momentum and the difficulty of stopping a moving object.
12. Show that the sun has heat energy.
13. Try to have children devise methods to do some of the classic experiments of physics outdoors.

Biology

The Biology Syllabus for the state of New York includes a basic core of seven units and extended areas. The core is compriced of the following units: The Study of Life, Maintenance in Animals, Maintenance in Plants, Reproduction and Development,

Transmission of Traits from Generation to Generation, Evolution and Diversity, and Plants and Animals in Their Environment. The remaining thirty per cent of the course is to be used in developing three of the extended areas. They include: Biochemistry, Human Physiology, Reproduction and Development, Modern Genetics, Modern Evolution Theory, and Ecology.

To explain the understandings and fundamental concepts of biology, I shall refer the reader to the Biology Syllabus, since 109 pages are too copious to reproduce. If you are interested, you may also refer to the Biological Sciences Curriculum Study, Blue, Green and Yellow versions.

As you may already assume, the biological activities that can be performed outdoors are almost infinite. The only limits are your imagination and the time to read and find the literature available. For each outdoor session I would suggest the following outline if applicable.

1. Investigation of the area of field study through topographic maps, 7½ minute series, hydrographic charts, etc.
2. Planning session; small group work to prepare materials for the gathering of specimens, collection, preservation, display, classification.
3. Reporting session; display of materials, field log of events, evaluation of small group planning and effectiveness, suggestions for improvement, contribution to class museum.
4. Plan as many field experiences as possible. Try to include a lake, stream, or pond; and estuary or mud flat; a forest and meadow; and a bog or marsh.

Activities: Water

1. Using drift cards, study, map and measure local wave-produced currents.
2. Utilizing old and new maps, determine the extent and nature of geographical changes along the coastline.
3. Make a photographic record of seasonal changes in beach configurations.
4. Use a recording tidal gauge and tidal staff to record outdoor phenomena.
5. Observe local surface currents with drift cards and dye markers.
6. Measure sub-surface currents with a current and flow meter.
7. Study seasonal variations in local currents.
8. Using a hand borer, note seasonal variations in sediment deposition as influenced by changing bottom currents.
9. Observe residual tidal response among organisms removed to a lab tank.
10. Make an analytical study of local tides by plotting maregrams.
11. Make a photographic study of extreme tides at a particular location.
12. Make a photographic study of local erosion problems.
13. Making use of a calibrated hand lead, map the local underseascape.
14. Make a comparative study of the salinity of an ocean and a bay.
15. Do quantitative and qualitative analyses of salinity using a water test kit.
16. Adjust a salt water killfish to a fresh water tank.
17. Using a bacterial sampler, make surveys of local waters.
18. Using drift cards, trace the course taken by the discharge of

19. Identify the major local pollutant.
20. Measure the carbon dioxide and oxygen of various types of water bodies over a 24 hour period; across seasons; a year. Graph changes. Use water test kit and sampler.
21. Using a water sampler, measure carbon dioxide and oxygen levels at various depths. Chart results.
22. Using a wet table, cold table aquaria, learn to culture local life forms under lab conditions
23. Take depth samples at various times during the day to plot graphically, vertical migrations of plankton.
24. Open stomachs of plankton eaters and note their contents.
25. Plankton samples can be collected in all seasons using nets, ring and bridle, and buckets.
26. Collect, identify, and preserve local algae using a collection and preservation kit and a sea weed collection kit.
27. Extract carageenin from Trish moss. Use it in the preparation of a chocolate dessert.
28. Make a chromatographic study of algal pigments.
29. Identify the organisms in local phytoplankton using a field guide.
30. Study succession along the banks of a pond.
31. Visit the local state fish hatchery.
32. Test the brooks and streams in suspected areas of sewage pollution and report your findings to your local health board officer..

Land

1. Study the effect of air upon root growth.
2. Develop an experimental garden plot on your school site and test the growth of plants in various enriched or depleted soils. You might also like to try growing irradiated seeds.
3. Study forest succession and if there is a recently burned area available, make sure you visit it.
4. Study the effect of competition between two different species of seedlings.
5. Make an earthworm count in a given size plot through the use of electrodes.
6. Plant leguminous plants in garden soil and in vermiculite to illustrate nitrogen-fixing bacteria live in the soil.
7. Study the ecology of a dead tree or rotting log.
8. Make interchange transplants from two different types of environments and make frequent observations over a period of several weeks to determine what kinds of plants can survive in their new environment.
9. Study competition among crops as to their yields.
10. Study the effect of the competition for light in various trees in a forest.
11. Determine which species of plant life live in the forest as opposed to open meadowland.
12. Apply a weed killer to a small patch of school lawn and later compare the size and vigor of the grass plants in the treated area with those in the untreated area.

13. Make collections of the plant and animal life in your area. First determine which ones are scarce and therefore left in nature.
14. Find out about the food of animals observed in a particular habitat and construct a diagram of the food web of that habitat. Similar diagrams may be constructed to indicate the food webs in surrounding habitats. It will soon be apparent that certain animals will cross from one food web to another, producing seeding relationships among several habitat communities.
15. Examine a rock where lichens are growing. Study symbiosis and the effect of the lichen upon the rock.
16. Count the number of different species of plants living in each layer of a forest plot.
17. Count the number of each species of plant growing in a particular plot.
18. Determine the daily temperature changes in two different types of habitats. Determine soil temperatures at the surface and at depth. Determine the relationship, if any, between the soil temperatures and the types of plants growing in a plant community.
19. Place cans of water in various types of plant environments and determine the rate of evaporation.
20. Determine the moisture content of the air near the ground in different plant communities by means of colbalt chloride strips.
21. Determine the water content of the soil. Weigh a coffee can of soil and then use infrared heat lamps to dry it. Weigh it again and determine the percentage of water.
22. Use a photographic light meter and a piece of whitr paper to find the light intensity on the ground in various habitats on a sunny day.
23. Determine the differences in plant populations between places with high and low light intensities. Make a list of the species that seem unable to live in low intensities of light.
24. Determine the relationship, if any, between light intensity and soil temperatute.
25. Determine the relationship, if any, between light intensity and rate of evaporation.
26. Determine the acidity of soils in various habitats by using any of the kits available from supply houses.
27. A group plant ecology survey of a small habitat. It could include the following: (1) Census of all plant life in the habitat. (2) Determination of the physical factors in the environment: a- soil acidity b- Humus content of soil c- Average water content of the soil d- Rate of evaporation e- Rate of water penetration into the soil f- Depth of topsoil g- Soil temperatures h- Average light intencity at ground i- Average relative humidity.
28. Prepare plant census lists of habitats found on the school property. This might include the following: a clump of trees. a dense wooded area, a base planting of shrubs, a portion of the lawn that is mowed regularly, the edge of a well-trodden gravel walk, a steep slope in a field, the edge of a stream, or cracks in the sidewalk or blacktop.
29. Study the zonal arrangement of plant communities around a pond.
30. Determine which species of plants and animals lived in your forests during the pioneer days and which are still present.
31. Make soil profiles of habitats in your area.
32. Determine the rate of decomposition of organic matter to form humus.

33. Determine the humus content of soil.
34. Visit your local sanitary land fill and determine if it is properly maintained to prevent pollution.
35. Visit your local cemeteries. Determine the number of deaths during the year 1918 and compare it with a government census of that time. You can obtain a reasonable accurate account of people who died in the flu epidemic of that year, if you compare it with another period, say ten years before. You can also determine the large number of people that didn't live to adulthood.
36. Study the effect of mulch on soil loss.
37. After a heavy rainfall collect water from a stream that drains from a pasture and from a stream that drains from a woodland.
38. Study the effects of fires on trees.
39. Study the effect of landslides upon plant life.
40. Survey the school property for signs of tree diseases.
41. Go snowshoeing in the winter to observe animal tracks.
42. Look for animal signs in the area, such as tracks and scat.
43. Determine why dandelions and plantain survive droughts better than most grasses. The reasons for this can easily be shown.
44. Test the vitamin content of cultivated plants as opposed to those obtained from nature.
45. Make recordings of the bird species in your schoolyard.
46. Use photography in unlimited ways. Students find it very rewarding.
47. If students are interested in identifying, teach them how to use a key. Many of them like to display their specimens for younger children.
48. Do art work with natural materials. There is time for it and students consider it a real treat.

SCHOOL SITE UTILIZATION

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Course

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Program Planning for the Classroom
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The following is a listing of activities which may be used by the classroom teacher to teach various subject areas utilizing the out doors. They have been limited to those applicable to the immediate school site. Ingenuity and the actual school site are the only limiting factors.

School Site Utilization - Science

1. Soil testing - P.H. minerals, temperature, type, etc.
2. Make Weather Station.
3. Identify minerals, color, hardness, etc.
4. Examine weather on buildings, wood, etc.
5. Observe and test air pollution.
6. Make terrarium - observe water cycle.
7. Melt snow, make observations
8. Nature Trail.
9. Plants, Trees, Shrubs - study of parts (bark, buds, leaves) throughout the seasons.
10. Clue Charts - animals, plants, etc.
11. Birds - feeders, listening, senses, etc.
12. Observe pavement, sidewalks - effects of climate upon them. What are they made from - cracks, tree roots, wearing away, etc.
13. Develop research into ecological environments in terms of various cycles (food, carbon dioxide, water, etc.).
14. Animal evidence - tracks, homes, droppings, feather, etc.
15. Survey animal population.
16. Shadows
17. Learning to use a watch compass.
18. Studying seeds and their distribution.
19. Mapping plant communities
20. Studying the seasonal changes in nature.
21. Estimate the time by shadow or position of stars.
22. Observation of the Heavens

23. Nature Scavenger Hunts.
24. Moon - times of moon.
25. Observing and adopting a tree for study.
26. Plant a tree, shrub, mini-garden.
27. Check relation of color to heat.
28. Explore with magnifying glasses.
29. Recognize some simple machines.
30. Make compost pile.
31. How do animals differ from plants.
32. Compare birds - bills, shapes, feet, etc.
33. Make collections - rock, seeds, plants, insects, flowers, etc.
34. Web of Life Game - How the various parts are interrelated.
35. Identify leaves and match with the branch.

School Site Utilization - Math

1. Measure the height of flagpoles, trees, buildings, etc.
2. Construct a map to scale using a compass.
3. Observe and list the different geometric designs from the school grounds. Circles (sun, holes), rectangles (bricks, etc.).
4. Measure off an acre.
5. Compare the temperature of different areas of the school site where the sun hits, and where it doesn't.
6. Measure off a square foot, square yard, and rod.
7. Measure distances of various objects using pace-angle method.
8. Measure precipitation.
9. Measure board feet in a tree.
10. Calculate circumferences and diameters of trees.
11. Make and use a clinometer with a protractor to measure degree of slope.
12. Use outdoor situations in counting and tallying (dandelions, etc.).

School Site Utilization - Math

13. Make calculations related to erosion by determining the volume material removed and deposited in an area.

14. Determine the speed of water.

15. Measure plant growth.

16. Calculate the number of bricks in a wall.

17. Scavenger hunt for numbers, finding leaves with 3 lobes, etc.

18. Investigate parking lot, etc., to solve the following problems: How many cars, what kind, percentage of total, percent of lot filled, percent of two-door cars, percent of four-door cars.

19. Figure costs - lighting, painting, paving, etc.

School Site Utilization - Language Arts

1. Listen to sounds - write descriptive phrases.

2. Observe and describe natural objects.

3. Poetry with natural objects as basis.

4. Use the senses - touch, smell, sight, taste, hear - then write descriptive paragraph.

5. Write similes or other figures of speech about objects outside.

6. "I was (any kind of natural object)....."

7. Describe everything within a given area.

8. Pretend you are a bird or bear, etc., describe how you would feel as you would pass through the area.

9. Write an autobiography of an object from nature.

10. Pretend you have supervision or hearing -- describe what you hear or see.

11. Compare and contrast objects of nature or other sounds of nature.

12. Listen to some moving water. Can you hear sounds that resemble words in the English language.

13. Adopt a tree or other plant and keep a diary.

School Site Utilization - Social Studies

1. Compare maps to natural settings.
2. Make a sketch map of school grounds.
3. On blacktop - Map of the United States; Compass Directions.
4. Study land formations and drainage on school grounds.
5. Study top soil from various location.
6. Study tree stumps - Living things around it; Make historic events on tree's annual growth; Low cut-different tools; Why cut?
7. Make a diorama using natural materials.
8. Make a study of the buildings on site - when built, why built, why particular material was used, style of architecture.

School Site Utilization - Art

1. Make rubbings (Aluminium foil, crayon and paper) to examine textures.
2. Crafts using natural materials.
3. Photography.
4. Blue prints.
5. Use natural dyes.
6. Paint, draw, etc., pictures of the area.
7. Using natural shapes construct picture.
8. Spatter prints.
9. Printing with natural objects - leaves, etc.
10. Make a crystal garden.
11. Sand casting.
12. Make nature puppets.

SOCIAL STUDIES IN THE OUT DOORS

BY

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August, 1972

Course

Ed. 515 Outdoor Education
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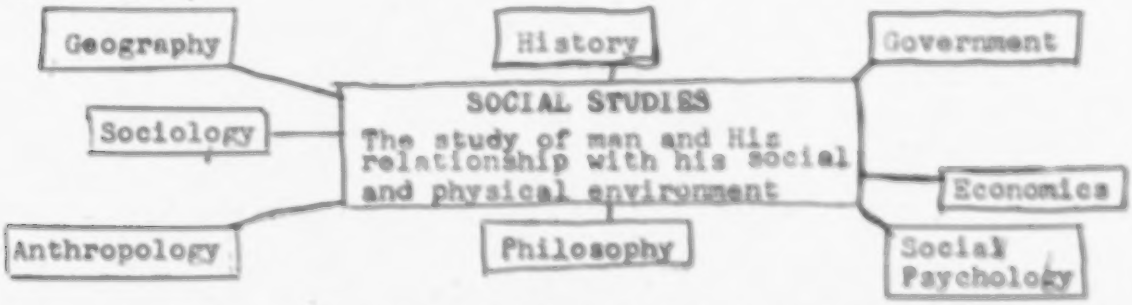
SOCIAL STUDIES

What is Social Studies?

In its very basic form, Social Studies is the study of man and his relationships with his social and physical environment. Rugg and Kreuger in their text, The Social Studies in the Elementary School, interpret Social Studies as, "all these activities and materials which are needed for an understanding of modern civilization and their historical development. They form a broad department which coordinated with the natural and physical sciences, the creative arts, and the language arts of reading, literature, writing, etc. Thus the Social Studies comprise the intellectual care of the entire school curriculum." Social Studies in a broad understanding then represents these instructional materials and means which promote human relationships. Areas of geography, history, economics, civics, sociology, anthropology, social psychology, and philosophy are today organized around the secila needs and interests of the students. The chart below from Programs in Outdoor Education (Freeberg, Tayler, 1963) also illustrates this concept.



As Social Studies has been defined on the previous page by Ernest Coons, our purpose is to relate its use in the out-of-doors through the utilization of a variety of specific sites at which we may incorporate many of the areas of Social Studies at a single experience.

By using a "site analysis" approach, we think that the classroom teacher may feel more comfortable in using a particular site to is best advantage.

Nearly all of the specific sites can be used with a variety of age groups and the specific activities can be modified to the needs and capabilities of each particular group at the discretion of the group leader.

A CAMP — Developing the concept of respect for the rights of others; learning to accept constructive criticism and suggestions graciously; establishing means for democratic living outdoors; developing a respect for group leadership; developing understanding and respect for patriotic traditions; developing mapping skills; studying land formation and drainage; sharing materials, tools and ideas; sharing responsibilities; developing a realization of the individual's relationship to a group; gaining self reliance, self control, and self respect.

A CEMETERY — Develope the understanding as to the location of the cemetery (high, well drained, often near church), religious background of buried, reasons for type of monument and carving (pictures, verses, materials monuments constructed of); understanding civic pride through condition of cemetery; develop understanding of trends of diseases, natural disasters, war, through study of dates and ages on monuments; developing respect for rights of others through behavior in the cemetery; study the history of the local area through background of names on monumnets, compare names on monuments with roads, streets, buildings, villages, etc. to determine influence on the area

CITY HALL OR GOVERNMENT BUILDINGS — developing a sense of participation in democratic government through participation in council meetings, etc; learning respect for group leadership; learn greater understanding of cooperative problem solving; developing respect for our form of representative government; learning how the government helps develop, control, and protect our natural resources; learn about agencies which contribute to the wise use of our natural resources; volunteer for participation in community good turn projects; identifying oneself with others.

A CROSS COUNTRY BEE LINE — develop the understanding and practical use of the compass, transent and other related instruments; develop concept and experience in accurate map making; learning map reading and construction; study land formation and drainage; develop concept of a land use survey; interview old settlers in area for history of area; take an inventory of the natural resources of the area; take and inventory of man's effect on the area in terms of industry, residences, preservation of natural areas, etc.; trace streams that cross line as to their effect on area; search for Indian relics and learn about Indians; visiting historical sits

A DAIRY FARM — develop concept of why farm is of dairy variety including soil types, land features, need of type of service, availability of outlet for products; effect of unit on the economy of the community; study modification in methods of dairying from early times to present; develop a product checklist (milk, cheese, butter, cream, etc); developing a relationship to a group

A DESERTED FARM — study land forms and drainage for background as to type of farm; study soil make up for understanding of why farm may have been deserted: study remains of buildings for information as to type of construction, materials used, affluence of residents, tools used in construction; relationship of water supply to house and barns; accessibility; relationship of barns to house, distance, direction, and why; develope understanding of the problems of the pioneers through dramatization; develope theories as to why abandoned; compare adaptations of people on farm and in urban live and their likenesses and differences; participate in archeological excavation or restoration; sketch house as it might have appeared; develop a list of the different kinds of trees and shrubs that had been planted both for ornmanental and practical use

A DISEASE — develop understanding of effect of types of diseases contracted by humans and other animals from insects, and other animals through observation of evidences found in cemeteries, farm stock modifications; results of human epidemics in past and methods of cure using environmental factors such as fresh air, herbs, feeds; effect of plant diseases on man's adaptation to his environment.

A HIGHWAY OR ROADWAY — compare different types of roads for purposes, uses construction materials; study history of the road and its modification from times of the path if relevant (trace history along it); study modification of methods of road construction; study the effect or roads on roadside environment, both natural and man made; develop concept of mapping skills through first hand observation; comparisons of past and present roadside lodging; comparisons of past and present means of transportation; relationships of roads to hamlets, villages, cities, etc.

HISTORICAL SITES AND MUSEUMS — develop understanding of effect of natural resources upon history of civilization; participation in archeological excavation or restoration; develop an understand of the effects of a site on a community and its development; compare artifact with hisory of local community, Have they modified or become non-existent; search for Indian relics and learn about the Indians; copy folk festivals through presentation of a pagent.

PLANTS — study uses of various plants in history such as uses as feeds, medicines, shelter, fuel; develop concept of relationship of plant life to animal life; constructive and destructive effects that man has had on plant life; importance of plant life in development of cultures and society in the past, the present and in the future.

AN ORCHARD — study to determine the reason for the particular location of the orchard such as terrain, drainage, climatic features, availability of land, etc; study effect on economy of area and economy as whole such as labor force during harvest and year round maintainance; effect on related industry such as bee keeping and crate manufacture, and canneries; modifications in methods of operating an orchard from earlier times to today.

A PAPER MILL (OR ANY INDUSTRY) — develop understanding as to location of industry including economic, geographic, political, etc; study the cycle of a forest and its repalcement learn about depletion of our natural resources and effect industry is having (positive as well as negative); study pollution abatement or lack of it; study a tree stump and trace historical dates through it; trace manufacture of a product today and compare with past methods; study methods of transportation of finished product; study effect of industry on area, including economic, environmental, etc; study the background of the employees as to education, nationalities, affiliations of all kinds, etc.

STRUCTURES (FENCES AND WALLS) — study the different types of walls and fences as to the reasons for their development in their particular types (stump or root, rail, stone); theorize as to effect on society; study society of living things on fences and walls and their inter-relationships; learning map reading and construction; developing and appreciation for the labors of the farmers who cleared fields and built walls.

WATER AND ITS IMPORTANCE IN THE ECOLOGICAL SYSTEMS OF THE WORLD

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Ecology is the study of the interchanging relationships and interdependence of living things to each other and to their environment. Our environment can be considered a web consisting of all the living and non-living processes which represent a separate point on this web where strands come together. Pull at any individual strand and the whole web is affected.

Since man is at the highest point in the life chain, he exerts control over all factors of the environment. In his attempt to improve his own environment he adversely affects the balance of the environmental web. It is our intent to provide some ideas which indicate that man must be more aware of his control and responsibilities to his environment in order that he and all other forms of life might survive in harmony.

Because water is one of the most important strands in our environmental web and one which is most at the mercy of man, he must be more aware of his interrelationship with this strand.

Water is a renewable, but finite resource which therefore places limits on all natural processes that can be supported on the earth. For this reason we have limited our project to the presentation of some basic concepts of the water cycle.

The basic water cycle is "sea ⟶ cloud ⟶ earth." Water from the sea evaporates into clouds; from the clouds it condenses and comes to the earth for storage and use; then the water returns to the sea for the start of the cycle again.

THE FOLLOWING IS A SUGGESTED LIST OF ACTIVITIES OR DISCUSSIONS RELATED TO ECOLOGY AND ITS SUBTOPIC, WATER. THEY ARE GROUPED TO APPROXIMATELY THE PRIMARY, INTERMEDIATE, AND JUNIOR HIGH LEVELS

PRIMARY

a. In what ways do plants and animals and people depend on sunshine, snow, and rain? For what purposes do we use water at school? At home? In the city? On a farm? How are water and air affected by plants, animals, people, and soil? What happens to rain and snow when they fall on the soil? How does snow affect people in the city? In the country?

b. Take a walk in the rain to observe how rain strikes the soil, sidewalk, grass, and trees. How soil moves with surface water, how rain drops cling to leaves, and how leaves cushion the force of raindrops, thus protecting the soil.

c. Take a walk when it is snowing. Collect snow and determine how much snow it takes to make a cup of water. Find out what happens to the water when snow melts in the city and in the country.

d. Discuss the uses of water in relation to every day activities of plant, animals, and man. This can be dramatized via murals, skits, etc.

e. Visit an industry in your community to observe its use of water.

f. Measure the amount of sediment in a jar of water taken from a stream immediately after a rainstorm and measure the amount of sediment in water from the same stream a week after the rainstorm. Allow the water to stand for about 24 hours before measuring and comparing the amounts of sediment found in each jar.

g. Develop a list of the ways that people use water carelessly.

h. In what forms have you seen water? What causes the water to change form, and how do the different forms affect human activities?

i. What is sediment? How does sediment in rivers and lakes affect fish and wildlife? The water you use everyday?

j. Select a plant and an animal found on the school site; explain what they need in relation to water.

k. Build a balanced aquarium or terrarium and then change one element at a time to determine the effect on the environment.

l. Compare the water running off a bare slope with water running off a grass-covered slope during a gentle rain. Collect a jar of water from both areas and compare the amount of sediment in each.

m. Start a school garden with different kinds of plants. Learn how to manage soil and water resources to encourage the growth of these plants.

INTERMEDIATE GRADES

a. What is a watershed? Does the way the land is used in a watershed affect water in small streams? In rivers?

b. What happens to water when it falls on the pavement? Rooftops? Soil? What determines how much water runs off and how much soaks into the soil? How do the different kinds and amounts of plant cover help water soak into the soil? Does water soak into frozen soil?

c. What happens to water once it enters the soil? Why is ground water important to plants and to people?

d. How does the amount of soil that washes off unprotected land into streams, rivers, and lakes affect your water supply?

e. Visit a cutover or burned-over forest, a building site or subdivision where topsoil is being washed away. Determine how the sediment laden water drains to a stream and what affect it may have on your water supply and the people and towns farther down stream.

f. Visit the city's water supply plant. Where does the water come from? Does the water have to be treated before it can be used by the people? Why?

g. Show the different rates at which water soaks into different kinds of soils.

h. Demonstrate how slopes and hills affect the way water runs off the land. Show some of the ways the water can be slowed when it runs off a slope. Show how rain splashes soil.

i. Relate local industries and agricultural practices to your supplies of water.

j. Visit and discuss recreational uses of water.

k. Discuss the place of producers, consumers and decomposers in water ecosystems. How might man's use of natural resources affect the soil, water, etc., in relation to the equilibrium of an ecosystem? Identify ecological principles important to the use and application of conservation practices.

l. Why must ecological principles be the base for designing and using successful conservation practices?

m. Outline on a map of your community or county the boundries of several watersheds; show how these watersheds form the drainage base of a river.

n. Attend a local planning meeting or public hearing where the use of land, water, and other resources will be discussed. Prepare a report on the results.

JUNIOR HIGH

a. Imagine the natural environment to be a huge jigsaw puzzle. What happens to the pattern when one piece is removed? Two or more pieces? How do conservation practices help keep all the pieces of the ecosystem jointly functioning?

b. What laws does our state have governing water quality? What are some important federal laws relating to the important resource, water?

c. Discuss the ways that you as a resource user affect the natural resources. Identify specific ways in which your family contributes to pollution.

d. What kinds of treatments are used in the disposal of sewage and solid wastes in your community? What effects do present treatment methods have on underground water supplies? Public health? Water pollution?

e. Write and produce a guidebook on water and its relationship to ecology for a lower grade.

PLEASE NOTE: Teachers may obtain other publications, maps, and aids by writing to the local Soil Service Office, Midtown Plaza, Room 400, 700 East Water Street, Syracuse, New York 13210.

A GLOSSARY OF ECOLOGICAL VOCABULARY

ACCELERATED EROSION - Washing away or blowing away of soil material in excess of normal erosion resulting from changes in the vegetation cover or ground conditions.

AMPHIBIA - A class of vertebrates comprising of frogs, toads, salamanders, newts, and related animals, most of which spend part of their life cycle in water.

AMPHIBIOUS - Refers to organisms that can live in water or on land.

AMPLITUDE - The range of an environment condition or complex of conditions in which an organism can exist or in which a process occurs.

ANTECEDENT MOISTURE - The degree of wetness of the soil at the beginning of a run-off period.

ANTHROPOPHILOUS - Refers to influences caused by man, e.g. cultivation.

AQUIFER - Aquefens soil or geological formation lying between impermeable strata in which water may move for long distances, yields ground water to springs and wells.

ARID - Refers to regions or climates which lack sufficient moisture for crop production without irrigation, precipitation 10 inches or less in cool regions, up to 15 or 20 inches in tropical regions.

BALANCE OF NATURE - The state in an Ecosystem when the interrelationships of organisms to one another and to their environment are harmonious or integrated to a considerable degree.

BANK STORAGE - Water absorbed by the bed and banks of a stream and return in whole or in part after the ground water level falls.

BASE FLOW - Stream flow originating from subterranean sources in contrast to flow from surface run-off.

BASE LEVEL - The lowest level to which a land surface can be reduced by streams, the permanent base level is the level of the sea.

BAYOU - A marshy body of water caused by seepage, lack of drainage, floods, tributary to a stream or lake, in flat country. A term used in the Gulf Coast region and in the lower Mississippi Region basin.

BOG - An undrained or imperfectly drained area, with a vegetation complex composed of sedges, shrubs and sphagnus mosses.

CHUTE - A high velocity conduit for conveying water to a lower level without causing erosion because of excessive velocity and turbulence.

CLIMATE - The aggregate of all atmospheric or meteorological influences, principally moisture, temperature, wind, pressure, and evaporation, which combine to characterize a region.

COFFER-DAM - A barrier constructed in a body of water so as to form an enclosure from which the water is pumped, to permit free access to the area within.

CONSUMPTIVE USE - The quantity of water used and transpired by vegetation plus the amount lost by evaporation.

CONTOUR STRIP CROPPING OR FARMING - The growth of crops on the strips between contour lines, at right angles to the slope. Strips of grass or other plants may be grown in alternation with the cultivated crops. A conservation practice to control or eliminate run off and erosion and permit greater infiltration of water.

CORRAISION - The process by which flowing water carring solid material weare away underlying rock, e.g. a stream carrying gravel and sand.

CREEK - A stream that is intermediate between a river and a brook.

DENUDATION - The processes by which the surface of the earth is worn away, including rainfall, wind, erosion,waves, tides, frost action heating by the sun, etc.

DEW POINT - The temperature at which a certain body of air is cable of holding no additional water vapor, so that any decrease in temperature or any increase in water vapor will result in condensation of the vapor into liquid water at this point the Relative Humidity is 100 percent and the saturation deficit is zero.

DROUGHT - An extended period of dryness, usually any period of moisture deficiency that is below normal for a specific area.

ECOLOGICAL FACTOR - Any part or condition of the environment that influences the life of one or more organisms.

ECOLOGY - The study of the interrelationships or organisms to one another and to the environment.

ECOSYSTEM - The community including all the component organisms together with the abietic environment, forming an interacting system.

EFFLUENT - The outflow of water from subterranean storage.

EROSION - The detachment and movement of particles of the land surface by wind, water, ice or earth movements such as land slides and creep.

EVAPORATE - To turn to vapor.

EVAPORATIVE POWER OF THE AIR - The environmental factor complex including factors such as temperature, relative humidity, and wind that influence the evaporation of water from organisms and from other bodies containing water.

EVAPOTRANSPIRATION - The sum total of water lost from the land by evaporation and plant Transpiration.

FLOOD PLAIN - The nearly level land forming the bottom of a valley in which a stream is present and usually subject to flooding.

FOG - The condensation of water vapor on particles of dust or smoke particles.

GLACIATION - The covering of an area by a glacier or by an ice sheet, or the geological action of the glacial ice upon the land.

GRAVITATIONAL WATER - Water in large pores in the soil which drains away under the force of gravity when under drainage is free.

GROUND WATER - Water standing in or moving through the soil and underlying strata, the source of water in springs and wells.

GULLY EROSION - Removal of stones, gravel and finer material by running water with the formation of channels that cannot be smoothed out completely by ordinary cultivation.

HAVITAT - The sum total of environmental conditions of a specific place that is occupied by an organism, by population or a community.

HOLARD - Term used to designate the total water content of the soil.

HUMIDITY, ABSOLUTE - The actual quantity of water vapor present in a given volume of air, usually expressed in grams per cubic meter.

HUMIDITY, RELATIVE - The ratio of the actual amount of water vapor present in a unit portion of the atmosphere to the quantity which would be present when saturated.

HYDROGRAPHY - The study of natural bodies of water such as lakes, rivers, and seas, especially their physical characteristics in contrast to the biological qualities.

HYDROLOGIC CYCLE - The cycle of the movement of water from the atmosphere by precipitation to the earth and its return to the atmosphere by interception, evaporation, run-off, infiltration percelation, storage, and transpiration.

HYDROLOGY - The science of water and snow, including their properties and distribution.

HYDROPHILOUS - Refers to a plant that grows well in water or wet land.

HYDROSPHERE - The parts of the earth covered with water including streams, lakes, oceans, etc.

IMPOUNDMENT - An artifical lake or pond.

INFILTRATION - The penetration of water into soil or other material.

LIMNOLOGY - The branch of biology that deals with fresh waters and the organisms in them.

LOTIC - Refers to running water as in a creek.

MARSH - A swamp in which grasses, sedges, catttails or rushes form the dominant vegetaion.

MESOSAPROBIC - Refers to an aquatic environment in which the oxygen content is considerably reduced and in which much decomposition of organic materials is taking place.

NORMAL EROSION - The erosion that occurs on land under natural environmental conditions not disturbed by human activities, mental conditions.

OLIGOTRPHIC - Refers to ponds and lakes that are low in content of basic nutritive substances for plants, lacking a distinct stratification of dissolved oxygen in summer or winter.

OUTWASH, GLACIAL - Material carried by streams of melted water from a glacier and deposited in the form of plains, deltas.

PELAGIC - Refers to the open water of the ocean, lacking association with the shore or the bottom.

PERCOLATION - The downward movement of water in the soil, especially in saturated or nearly saturated soil.

PERMAFROST - Permanently frozen ground in artic and subartic regions.

PERMEABILITY - The property or condition of the soil that relates to the passage of water or air through it.

PLUVIAL - Refers to rain.

PRECIPITATION - (1) A general term for all forms of falling moisture including rain, snow, hail, sleet, or modifications of them. (2) The quantity of water that is precipitated. (3) The process in which water as a liquid is discharged from the atmosphere upon land or water.

RAINFALL - The total amount of precipitation including rain, snow, hail, and other forms.

RAIN GUAGE - An instrument to measure the amount of rainfall.

RAVINE - An elongated,narrow depression, larger than a gully, usually formed by running water.

RUN-OFF - The part of precipitation which as surface run-off flows off the land without sinking into the soil and the part that enters the ground and passes through into surface streams as groundwater run-off.

SALINITY - The quality of saltness in sea water or fresh water, most commonly expressed in parts of dissolved salt per 1000 parts ow water.

SECOND FOOT - A measuring unit for the volume of the flow of water expressed in cubic feet per second.

SEEPAGE - (1) The water that passes through or emerges from the ground along a line or surface in contrast to a spring where the water emerges from a localized spot. (2) The process by which water passes through the soil.

SILTING - The deposition of water-borne sediments in bodies of water caused usually by a decrease in the velocity of the water movement.

SNOW DENSITY - The water content of snow expressed as a percentage by volume.

SOIL EROSION - The loosening and movement of particles of soil from the surface of the land by wind or flowing water, including accelerated erosion and normal erosion.

SPLASH EROSION - The direct effect of the impact of rain drops on the ground surface or on a thin film of water causing detachment of soil particles which are than readily available for washing away.

STILLING BASIS - An excavation or structure below a waterfall or rapids that reduces the velocity and turbulence of the current.

STREAM - A general term for water flowing in one direction such as a brook, creek, and river.

STRIP CROPPING - The growing of crops in narrow fields or strips so that wind and water erosion is reduced or prevented.

SUBIRRIGATION - The control of the water table so as to raise it near or into the root zone.

SUCCESSION (ECOLOGICAL) - The replacement of one kind of Community by another kind.

SWAMP - A land area containing excessive water much of the year and covered with dense native vegetation that includes trees, but the term is used with various meanings.

TOPOGRAPHY - A general term to include characteristics of the ground surface such as plains, hills,and mountains.

TRANSPIRATION - The loss of water in vapor form from a plant.

TURBIDITY - The condition of a body of water that contains suspended material such as clay or silt particles, dead organisms or their parts, or small living plants and animals.

WATER GAP - A narrow valley or gorge in a ridge of mountains or hills, eroded by a stream.

WATERLOGGED - The condition of the soil in which all the pore spaces are filled with water.

WATER SHED - The total area of land above a given point on a water way that contributes run-off water to the flow at that point.

WATER SPREADING - The application by means of stream diversion or otherwise of water over the land in order to increase the soil moisture supply for the growth of plants or to store it underground for subsequent withdrawal by pumping.

WATER TABLE - The upper surface of the free ground water in a zone of saturation except where it is separated by an underlying body of ground water by unsaturated material.

WEATHER - The state of the atmosphere at any given time with regard to precipitation, temperature, humidity, cloudiness, wind movement, and barometric pressure.

CONCEPTS AND RELATED ACTIVITIES TO THE WATER CYCLE

A. Certain understandings of characteristics of water resources and their distribution and status are essential

1. Water is a self replenishing and self depleting resource, it is intermittently replenished by precipitation and is steadily depleted by evaporation, transpiration, percolation and surface and underground run-off which may eventually find its way to the sea.	1. Make a closed terrarium.
2. Water tends to cling to earth particles and to spread throughout the earth materials by cappillary action.	2. Fill a clear container with soil--pour in water and observe. Find a sample of dry soil (A garden, sand pile), pour water on top and observe.
3. Water is unevenly distributed geographically and the quantity of water in any locality varied from time to time.	3. Choose any area around the school, make observations before and after a rainstorm. Rain falls evenly over a given area. Does it stay where it has fallen.
4. Water is a very active and mobile resource. It is hard to capture and keep where it is wanted, or to keep out of places where it is not wanted.	4. Observe the movement of rocks and soil placed on a sidewalk, driveway, or roadway before and after a rainfall.
5. Water readily dissolves and carries away a wide range of substances.	5. Where did the salt water in the ocean come from? Take a can and punch holes in the bottom. Fill the can with a mixture of common table salt and sand or soil. Pour an equal amount of tap water in the can. Have children taste the water after it has passed through the can.
6. All phases of the "water cycle" are closely related.	6. Make a closed terrarium. Make a weather project with temperature, humidity and precipitation measurements of the air and temperature measurements of the soil. This will involve observing, recording and making generalizations over a period of time.

B. Understanding uses of water and its uses to man.

1. Water is indispensable for plant and animal life and varies with climatic conditions.	1. Make 3 terraria--dry land, grass and forest. Compare the dependence on water of the life in each. Survey plant and animal life at varying distances from a pond noting their dependence on the water. Were they equally dependent?
2. Demands for water are increasing at a greater rate than the rate of population growth.	2. Students will make a survey of "old timers", parents, and peers to compare the demand on water during the youth of each group. Survey questions should include what the water was used for, the amount used, etc. Graph and share results.
3. In any given location, the ease of water's availability tends to influence the use made of it.	3. Have students use <u>one</u> water source in the school for all their needs for an entire day. Encourage them to continue this at home. Do they think twice about using water?
4. Activities on upstream and adjoing lands frequently affect the usefulness of any given body of water.	4. Field trip to a business or industry on or near a water supply. Observe and compare this water supply with one removed from any such activity. (Check your local dump and its proximity to a water supply.)

C. Various problems and techniques of management of water resources must be kept in mind.

1. Control of pollution is an essential aspect of water management.	1. Field trip to a sewage outlet;is this water recyclable, meaning active in the water cycle. Have two sample plots of grass, over a week's time water each plot, one with fresh water, the other with water mixed with detergent. Analyse the results after a week or so.
2. Certain land management practices help to reduce the flood waters and silt that small streams empty into rivers and lakes.	2. Observation of ditches around school, farms, etc.

3. Transporting and storing water to meet increasing needs require experience and management techniques.	3. Make a scrapbook of newspaper and magazine articles and pictures of dams or any new water management plan (i.e., the California aquaduct, the TVA, etc.) Are there any such plans involving your area? If so what might the results be?

D. Water resource conservation demands specific policy and administration of this policy.

1. Because water resources recognize no state, county, township or municipal boundaries in their occurence and all units of government be given maximum opportunity for cooperating to solve mutual management problems.	1. For a summary activity discuss who owns the water. In this discussion the students should be knowledgable in the previous concepts from the activities completed. (Why not do this at your nearest local water supply?)
2. Good public understanding of water resource problems, possible solutions, and management are extremely important.	2. Students should feel involved and a part of the water cycle. Guide students in community awareness through posters, contributions to local newspapers, suggestions to local government planning sessions, meetings, etc., program for parents, teachers and all members of the community when the student becomes the educator. This aspect is vital.

Following is a list of supplementary activities related to our environmental web:

<u>WATER</u>

1. What is the source of your local drinking water supply?

2. Devise a way of measuring the evaporation rate of water in different locations and under different conditions and at different times of the day and year.

3. How do local industries or utilities use water? What happens to it? What condition is it in after use?

4. Determine how water run off and absorbtion have been altered by land that has been covered with cement or asphalt?

5. From a sample, estimate the number of leaves on a tree. Estimate the amount of water given off by the tree in one day through transpiration.

6. Take a field trip to the local sewage disposal plant. Find out prior to the trip if the plant is primary or secondary treatment.

SOIL

1. Make s survey or check the local community to discover erosion hazards.

2. Rub pieces of limestone, sandstone, etc., together to illustrate how long it takes nature to form soil.

3. Compare the depth of topsoil in different locations.

4. Compare the amounts of organic matter in various soil samples.

5. Attempt to determine the age of rock in your area.

PLANTLIFE

1. Observe the growth rings in a tree stump to determine how aspects of the natural environment have affected the tree through the years.

2. Mark off quadrants of one square meter in different plant communities to compare: the types of plants, amount of bare ground to that covered with vegetation, amount of basal area of each plant compared to the area covered by foliage, light intensity, temperature of the air and soil, mosture present, soil compactness, water absorbtion rate, and air movement.

3. How has man damaged natural vegetation in your area?

ANIMAL LIFE

1. Make a population census of small animals in an area.

2. Estimate the number of birds in a flock.

3. Make a profile chart of various local animals that can be observed and indicate at which level of the community they feed, i.e. underground, on the ground, at the bottom of trees, near the top, overhead.

4. Make a survey of insects and the plants on which their evidences are found. Estimate the total number of certain kinds of insects in an area.

5. How has man's use of the land affected or changed the wildlife in your community or region? What animals have moved away and which ones have adapted to an altered environment?

POLLUTION

1. Bring in a dirty furnace filter to illustrate the dust and foreign particles found in household air.

2. Count a specific number of automobiles and note the number with excessive exhaust fumes. A graph can be made showing the relationship.

3. Estimate the number of automobiles your community has and estimate the amount of pollutants added to the air each day by them. Is there any way to cut down on these pollutants, i.e., public transportation, car pools, bicylces.

Because ecology involves the interaction of all living and non-living processes, this unit on the water cycle can easily be adapted to the other major processes in our environmental web: sun energy, soil, plant and animal.

be flexible and imaginative!

THE FOLLOWING IS A LIST OF THE NAMES AND ADDRESSES OF SOME FILMSTRIP PRODUCERS WHO PUT OUT SELECTED MATERIALS IN RELATION TO WATER, CONSERVATION, AND ECOLOGY. A SERIES OF CODE LETTERS IS GIVEN FOR EACH COMPANY.

NAME AND ADDRESS	CODE LETTERS
Colonial Films 71 Walton Street, N. W. Atlanta, Georgia 30303	CF
DeKalp Agricultural Association 310 North Fifth Street DeKalb, Illinois 60115	DK
Encyclopedia Britannica Films, Inc. 1150 Wilmette Avenue Wilmette, Illinois 60091	EB
Eye Gate House, Inc. 146-01 Archer Avenue Jamaica, New York 11435	E-G
Jam Handy Organization School Service Department 2821 East Grand Boulevard Detroit, Michigan 48211	JH
Long Filmslide Service 7505 Fairmount Avenue El Cerrito, California 94530	LFS
McGraw-Hill Book Company Test Film Division 330 West 42nd Street New York, New York 10036	M-H
Nasco Industries, Inc. Fort Atkinson, Wisconsin 53538	NASCO
Pat Dowling Pictures Distributed by: Baily Films, Inc. 7509 DeLongpre Hollywood, California 90028	PD

Society for Visual Education, Inc. SVE
1345 Diversey Parkway
Chicago, Illinois 60614

DOI, Bureau of Reclamation USBR
Building 63, Denver Federal Center
Denver, Colorado 80225

Water Resources Association
Distributed by:
Training Films, Inc.
150 West 54th Street
New York, New York 10019 WRA

THIS LIST OF FILMSTRIPS IS MEANT ONLY AS A SELECTED ADDITION TO ANY OTHER A-V MATERIALS THE CLASSROOM TEACHER MAY HAVE RECOURSE TO.

TITLE	COMPANY CODE
BALANCE OF NATURE	E-G
BALANCING THE SUPPLY AND DEMAND	EB
CHANGES IN ECOSYSTEMS	M-H
CONSERVATION OF HUMAN RESOURCES	E-G
CONSERVING WATER AND SOIL	FD
CYCLE OF NATURE	E-G
DEMAND, THE	EB
ENOUGH WATER FOR EVERYONE	EB
GREAT FLOOD, THE	NASCO
HUMAN ECOLOGY	M-H
INTRODUCTION TO ECOLOGY	M-H

The following are all listed under SVE films: Lets Explore a Field, Let's Explore a Lawn, Let's Explore a Pond, Let's Explore a Stream, Lets Explore a Woodland, Life in a Bog, Life in Relation to Environment.

MANAGEMENT OF WATER, THE	M-H
MIRACLE OF WATER	USBR
MUDDY RAINDROPS, THE	SVE
POND AS A COMMUNITY, THE	M-H
WATER AND ITS CONSERVATION	E-G
WATER BIRDS	EB
WATER CONSERVATION TODAY	SVE
WHAT IS CONSERVATION?	EB
WIND AND WAVES	SVE
WORK OF RUNNING WATER	SVE

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Population, Resources, Environment, Issues in Human Ecology, Elrlich, Paul, Freeman & Company, 1970.

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STOP, Society to Overcome Pollution, Montreal, Canada.

Teacher's Packet for Conservation Information and Education, Department of Conservation, Albany, New York 12226.

Techniques for Teaching Conservation Education, Brown, Robert, Burgess Publishing Company, 1967.

Understanding Ecology, Billington, E. Warne and Company, N.Y. 1968.